THE

DENTAL COSMOS:

A

MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

J. H. McQUILLEN, D.D.S.
GEO. J. ZIEGLER, M.D.

Observe, Compare, Reflect, Record.

VOL. IX.

PHILADELPHIA:
SAMUEL S. WHITE, PUBLISHER,
528 ARCH STREET.
1867.

LIST OF CONTRIBUTORS

TO

VOLUME IX.

H. L. Gilmour, D.D.S.	Cape Island, N. J.
Geo. Watt, D.D.S.	Cincinnati, Ohio.
J. S. Scott, M.D.	Cobourg, C. W.
Edmund Noyes	Dubuque, Iowa.
J. D. Miller, D.D.S.	Easton, Pa.
S. P. Cutler, M.D., D.D.S.	Holly Springs, Miss.
Henry S. Chase, M.D., D.D.S.	Iowa City, Iowa.
E. Palmer	La Crosse, Wis.
J. S. Smith, D.D.S.	Lampeter Square, Pa.
W. Nichols Amer	Lancaster, Pa.
W. H. Webb, D.D.S.	" "
Thos. Fillebrowne	Lewiston, Maine.
F. K Crosby, D.D.S.	Lynn, Mass.
F. W. Garkey, D.D.S.	Memphis, Tenn.
J. Hardman	Muscatine, Iowa.
John C. K. Crooks, M.D.	N. Baltimore, Mich.
J. H. Smith	New Haven, Conn.
James Carson	New Market, Tenn.
J. G. Angel, D.D.S.	New Orleans, La.
A. F. McLain, M.D., D.D.S.	" "
E. A. Bogue	New York, N. Y.
Rufus King Browne, M.D.	" "
W. C. Horne	" "
C. E. Latimer, D.D.S.	" "
J. S. Latimer, D.D.S.	" "

Harrison Allen, M.D.	Philadelphia, Pa.
Charles A. Blake	" "
Geo. W. Ellis, M.D., D.D.S.	" "
J. H. McQuillen, M.D., D.D.S. . . .	" "
Thos. C. Stellwagen, A.M., D. D.S. . . .	" "
A. Homer Trego	" "
Geo. J. Ziegler, M.D.	" "
W. L. Pierce	St. Paul, Minn.
Charles Barnes, D.D.S.	Syracuse, N. Y.
Donaldson Mackenzie, M.D.	Tunbridge Wells, Eng.
R. C. Mowbray	Warsaw, Ill.
W. C. Barrett	Warsaw, N. Y.
James A. Price	Weston, Mo.
M. D. L. Dodson	Williamsport, Pa.
S. Marshall	Wilmington, Del.

CONTENTS OF VOL. IX.

ORIGINAL COMMUNICATIONS.

PROCEEDINGS OF DENTAL SOCIETIES.

EDITORIAL.

BIBLIOGRAPHICAL.

CORRESPONDENCE.

PERISCOPE.

THE

DENTAL COSMOS.

NEW SERIES.

VOL. IX. PHILADELPHIA, AUGUST, 1867. No. 1.

ORIGINAL COMMUNICATIONS.

NECESSITY OF ROOT FILLING.

BY J. H. M'QUILLEN, M.D., D.D.S.,

PROFESSOR OF INSTITUTES OF MEDICINE IN THE PHILADELPHIA DENTAL COLLEGE.

IT appears singular, after the conclusive evidence afforded by millions of successful cases, that the necessity of thoroughly filling with some material the canals of teeth from which the dental pulp has been removed, should at this late date demand reaffirming. Yet such is the case, and writers are found even now who, regarding this operation as unnecessary if not detrimental to the well-being of the teeth, simply advocate the removal of the devitalized pulp and any foreign substance which may be found in the pulp cavity, and then leaving the latter unfilled, merely introduce a stopping in the cavity of decay, and in anticipation of difficulty arising from the generation of gas in the pulp cavity as the result of the decomposition of fluids or solids, propose that an opening shall be drilled into the side of the tooth, that the mephitic exhalation may have an opportunity to escape.

This plan of treatment, which was popular years ago with some practitioners in our midst who were more remarkable for the slovenly character of their operations than any other peculiarity, it was hoped had been abandoned by all who claimed to be thorough operators and progressive men.

Regarding the course advocated as a retrogressive rather than a progressive movement, and one which an extended and careful observation of over twenty years has proved to be a very objectionable one, I cannot but take exception to it, and in doing so simply discharge a duty which one owes to the profession, of giving utterance to candid convictions under such circumstances.

Some years back I demonstrated by a series of carefully conducted experiments, which were confirmed by other observers, that fluids can pass by imbibition through the cementum and dentine into the pulp cavities when the foramina are closed.

A number of extracted teeth with large cavities leading to the pulp chambers were carefully excavated, thoroughly dried, and hermetically sealed by closing the foramina and cavities of decay with wax. The teeth were then placed in water, and, after remaining there a few hours, removed, and the pulp chambers found invariably occupied by water, which could only have entered by transuding through the walls of the teeth.

These experiments were instituted to prove that the liquor sanguinis and other fluids in this way could enter the pulp cavities of teeth which were left unfilled as in the plan proposed above, and then decomposing become prolific sources of trouble to the patient. It is not necessary to enter into a detailed consideration of those experiments now; but it may not be amiss to state that the experience of the intervening years has confirmed the correctness of the position maintained by me at that time.

Over and again, cases have been presented in which the plan under consideration had been pursued, and the teeth invariably found discolored, the pulp cavities occupied by fluids or gases exhaling the most unpleasant odors; the pulp cavities, the seat of caries, which, involving large portions of the dentine of the crown and extending far into the roots, convert the teeth into mere shells, demanding for their preservation the greatest possible care, an extended experience, a high order of skill, and a large outlay of time and material which patients are frequently indisposed to compensate for, and if they do so, making unjust complaints of the charges demanded for the service rendered. Fortunately there are persons who fully appreciate such efforts, and not only gladly pay for the service, but in addition manifest a lively appreciation of the same by the most hearty acknowledgment of their indebtedness for the satisfactory result at last obtained by them. Such operations, even with the largest fees, however, are by no means desirable, and it is to be hoped that very few of the old or young practitioners will adopt a mode of treatment calculated to largely increase the number of such cases and bring merited reproach upon the profession; for nothing can be more unsightly, or reflect more unfortunately upon an operator, when justly chargeable to him, than a discolored tooth in an otherwise perfect set, and the general health cannot but be injuriously affected by fluid or gaseous emanations from diseased dental organs.

To prevent such undesirable results, the proper plan of procedure, according to my experience, is to thoroughly cleanse the pulp cavity of all foreign substances, and then, as soon as the tooth is in a proper condition, fill it compactly with gold. While advocating this material as the best and most reliable, Hill's stopping, cotton, or any other substance of analogous character would be preferable to leaving the pulp cavity entirely unfilled.

HOW TO CONSTRUCT AN ARTIFICIAL PALATE.

BY E A. BOGUE, NEW YORK.

In accordance with an editorial request made long since, as well as at the request of several of my professional friends, I will endeavor to explain how to construct the apparatus that I use in cases of cleft palate.

Preparatory Requisites.—Before attempting anything in this direction, it will be well to be provided with four or five sheets of soft rubber (that furnished by Julius A. Bidwell, of Sturgis, Michigan, for flexible air-chambers, is the best that I have yet seen, and by far the most durable; S. S. White can furnish a soft rubber that answers pretty well); some fine impression plaster that sets quickly; six pounds of stereotype metal, or Dr. Barker says, white metal, newly made (do not take old type and melt it over); two Whitney's flasks, as flaring as possible, one a new one, with smooth points, strong nuts, and easily running screws; a Hawes' or other flask for moulding, that separates, so that you can mould an article entirely within the flask and sand; fine moulding sand, that can be got at any brass founder's by asking for *old* sand that has been much used; some pulverized charcoal, in a muslin bag, to separate the parts of your flask in moulding, and a tumblerful of a thick solution of soap.

Impression.—To take the impression, have the patient come in the morning, before fatigue has wearied the body and relaxed the muscles; give the forenoon to it if possible. Fit an impression cup to the mouth, cutting and bending, if need be, to allow for any malformation that may exist, as well as for the teeth. When the cup is fitted, rivet to the under side of it a piece of sheet copper, or even thick tin, about three-fourths of an inch in width (a tin teaspoon handle is not the worst thing that might be taken), allowing it to extend far enough beyond the back edge of the impression cup to have it reach just below the extreme lower edge of the cleft when in the mouth. Bend this to the same general shape as the soft parts to which it will be contiguous when in position, and with very soft wax on this impression tin, get an impression as far down as the lower pendulous portions appearing on each side of the cleft (the divided uvula).

Trim this wax impression, so that when replaced in the mouth it can easily be seen when the teeth are back in their impressions in the wax; and also trim the lower portion, so that it will not touch the tongue, or choke the patient; then bend up the back edge of the wax a little, so as to prevent the plaster from running down the throat, and you are ready for your impression. Have a pair of long tweezers by you on your table, where you can easily reach them. Now fill your wax impression pretty full of plaster, piling it up in the middle, put a spatulaful right up in the cleft, pushing it to each side with the spatula or finger; then quickly put your impression tin in the mouth and carry it steadily up to its place.

Have the bowl, in which your plaster has been mixed, on your table by you, and, while retaining the impression in place with the left hand, with the right turn up some large lumps of plaster with the spatula in the bowl; as soon as these lumps are sufficiently set to break between the fingers with a clean fracture, your impression must be at once removed from the mouth; do it carefully, and without flurry. If it breaks off at the edges of the cleft, all right; lay down the impression cup, take the long tweezers and seize the portion of plaster that is above the cleft, moving it gently to and fro until it is detached from its place; then carry it carefully backward and down the throat until it passes the contracted portion of the orifice, when it can be easily removed from the mouth, and by putting the two parts together you have your impression.

If the piece broken off has not a well-defined impression of the parts adjacent to it, viz., the portion above the margins of the cleft and extending down behind the soft palate, just make one or two conical depressions (such as you would make in a plaster articulating model) in the middle of your impression, where the upper part has broken off, and dip the whole impression into the solution of soap for half a minute. Fill the cleft again with freshly mixed plaster, being careful to put it thoroughly in behind and above the margins either with the spatula or finger; then insert the impression and press it up to its place, keeping it there until the plaster in your bowl shows you, as before, that it is time to remove it. The soap enables you easily to separate the impression and the fresh plaster, and you pursue the same course in removing the upper part of the impression as before.

Plaster Cast of the Cleft.—Having obtained a good impression, fasten the two parts slightly together with wax or silex, or with what you will, and pour one side of it, from the mesial line between the central incisors to the corresponding point at the back end of the impression, letting your plaster come up to the widest part of the upper piece of the impression—no further. When this has set, you can trim it with a sharp penknife without removing it from the impression; then soap or oil it, and pour the other side in the same way; trim that, and make in the top of both these side-pieces some conical depressions, as before described; then over all pour the final portion of the cast from the incisor teeth, back to half an inch or so beyond the impression, and about half an inch in thickness. When this is perfectly set, a little tapping with a wooden mallet will cause your cast, and probably your impression too, to drop apart. Upon replacing the three sections of the cast, you have a duplicate of the mouth and cleft, providing that your impression was good.

Illustrations.—On this you are to model in gutta-percha or wax (I prefer the latter) the pattern for your future palates.

Wax Model.—First extend a thin slip above and behind the margins of the cleft, corresponding to its irregularities, from the front to the rear,

as far down as your impression will allow; let it fit accurately; then at about the point where the hard palate terminates thicken up your wax until it fills the cleft, and you are able to lay a thin sheet of wax, as large as a 25 cent coin, and shaped like a rubber plate, across the roof of the mouth, without any very abrupt dipping into the cleft. Bevel this off around the edges, and your model is done. Remove it and make another just like it.

Rubber Models.—Having got your two patterns in wax, oil them smoothly, and having also thoroughly oiled your two Whitney's flasks, fill the lower part of each three-fourths full of plaster, and put a pattern in each flask, top downward (by top I mean the superior surface regarded as in the mouth), gently sinking them in the plaster until you are sure of a good impression of their upper surfaces from front to rear. When the plaster is set, trim it down smoothly, being careful not to disturb your patterns, and clear out any portions of plaster that may have run into the depressed sides of the patterns (which embrace the edges of the cleft) or that may have run over the bottoms of them (the bottoms being uppermost now), and make a conical depression in each side of the plaster opposite the front portion, to keep the sides in place when they are cast. Then pour the sides, allowing them to run from the mesial line back to a little beyond that portion of the wax shaped like a plate, which lies on the roof of the mouth, and when they are set and trimmed, bevel their ends so that the top part that you are to cast will draw off easily; then soap or oil them, and pour the top filling up full.

Upon warming the flasks and removing the wax, as you would for a rubber plate, you have the plaster moulds for two palates, one to be made of soft rubber, that you can try in the mouth, and the other to be made of hard rubber, that you will use as a pattern from which to get up the metallic moulds for the final instrument and its duplicates.

In packing these plaster moulds you need but one thickness of rubber for the major part of the palate, a few small pieces where the wax was thickest, one thickness in that part corresponding to the wax that you laid in the roof of the mouth and beveled to an edge. Put in the larger piece first, then put the two side-pieces of the mould in their places, the small pieces for the thick part, and then the last piece; put on the top part of the mould, and screw your flasks together without much force; if the screws run easily the fingers are enough; boil the flasks, and gradually screw them up tightly, as for a rubber plate, being very careful not to break the pieces of your moulds. Then vulcanize in the same temperature and time as you require for your hard rubber. Upon removing these palates from the flasks, clean them, file the hard one smooth, and trim with scissors all excrescences from the soft one, and let the patient come and have it tried in.

Fitting the Rubber Model.—If it should prove too long, too wide, too

thick, or in any way too large, trim it with scissors or burn it down with a red-hot iron (the handle of an old excavator is good), or both, afterward washing the burnt rubber off with spirits turpentine. It can thus be altered gradually until it is right and comfortable. If it should be too small, you have your work to do over again.

The indications to be fulfilled are: first, a close adaptation to the parts, the edges of the artificial palate lying lightly upon, yet in contact with the superior surface of the shelf formed by the palatal bones, the velum palati, and the pharyngeal muscles; length sufficient to almost touch the posterior wall of the pharynx, and the shape of this posterior edge exactly the converse of that portion of the pharynx nearest in contiguity to it, so that it may seem to fit it accurately. Second, ability on the part of the patient to swallow and to move the parts, as in speech, without in any way interfering with the instrument, or causing pain. Third, perfect ease and comfort to the patient.

If you should by chance or skill obtain so perfect an adaptation as to cause the complaint of difficulty in breathing, on the part of the patient, a seeming "as though it caught somewhere," as was once expressed to me, congratulate yourself highly, for it will be easy to trim one or two instruments on the posterior edge, to be worn until the patient is familiarized with the feeling of the instrument in the mouth, after which the original length can be used, inasmuch as the flexibility of the rubber is sure to allow enough air to be inspired, while a slight lifting of the side edges which takes place is pretty sure to suffice for all purposes of expiration, as soon as the patient is thoroughly accustomed to the feeling of the instrument.

Having made yourself sure of the fit of your soft rubber model, your hard rubber one is supposed to be right also, as you will have filed carefully from it, as you went along, just that portion corresponding to what you cut or burned from the soft one, so that no forgetfulness might spoil your work; and in case any beveling needed to be done, you will have done that also by oiling the hard rubber, and holding it over your alcohol lamp until soft, and then beveling and retaining in position until cold.

Metallic Moulds.—Now smooth and polish your hard rubber model, and drill a hole about 3-32ds of an inch in diameter through the thick portion of it, from top to bottom. With a clean, strong Whitney's flask go through the same process that you did with the wax, viz., making a sectional plaster cast in four pieces, only using fine plaster, and taking the utmost care to have no air-bubbles and no broken or rough edges on these plaster casts. Remove them carefully, therefore, having used the solution of soap to separate them, in order to insure greater smoothness; varnish with thin varnish, so as not to form a visible coating on their surfaces, and let them stand until quite hard and perfectly dry. These four pieces are to be duplicated in stereotype metal. They can be moulded in

Hawes' flask by the aid of a little board with the centre cut out for the top and bottom sections to set in as far as the bevel on them is the wrong way, and having some holes bored into it for the reception of the pins of the flask, it is held securely during the process of moulding. These four parts being duplicated in metal, they are to be trimmed of all superfluities, smoothly finished up, and fitted to each other and to the flask, being careful that those portions that are to form the *edges* of your future palate are not injured in any way, as upon their integrity depends the nicety of your palate in a great degree. Burnish smoothly all those parts that form the palate, and drill a hole in the bottom piece of your mould for the reception of a stout steel pin, at the point marked by the hole that you have in the hard rubber model; this pin should be firmly inserted, and should extend up a short distance into the top piece of the mould; it is to form the hole by which the palate is to be retained in its place when finished.

Packing and Vulcanizing.—All these parts being fitted to each other, and those portions that form the palate being smoothly burnished, you are ready to make your instrument. First soap your moulds thoroughly, then proceed to packing as you did when your mould was plaster, *i.e.* cut out a single thickness of soft rubber just the size that the upper portion of your palate is to be, punch a hole in it so that it may go on the steel pin and be held in place firmly; put it in its place; then put on the side-pieces of the mould, then a few pieces of rubber where the palate is to be thickest, and then, if your cleft is very large and you can get greater firmness in position, or if there is to be a large portion of the palate exposed to the action of the tongue, food, and fluids of the mouth; put on one thickness of hard rubber which will extend over a portion of the roof of the mouth, and be less destructible than soft rubber in the same position. If these reasons for using hard rubber do not exist, then use soft, cutting out a piece the proper size, punching a hole through it and placing it in position. Put your flask together, screw up, boil it and screw up tightly, then cool it off in cold water; open the flask and trim your palate of all superfluous rubber, remembering that you have no surplus gates here. Resoap your moulds, so that your palate may not stick to them and be torn (avoiding air-bubbles as much as possible), replace your palate, boil it a few minutes until heated through, screw up again tightly, and vulcanize. I have found one hour and thirty minutes at 290° to give me good results; allowing about thirty minutes to run the heat up to that point. If hard rubber be used, vulcanize at 290° for two hours, and 305° for one hour. Upon removing your palate from the flask, you will find a thin, paper-like edge, which needs trimming off with sharp scissors; otherwise, if your moulds, hands, and rubber have been clean, you have your palate complete. If you have the hard rubber in front, you can polish it.

Now insert it in its place in the mouth, with a bit of floss silk running through the hole in the palate, which can bé either attached to the teeth or held in the hand, while an impression is taken with the palate in its place for the plate. The hole in the palate marks the place in the impression, and thence into the plate, where the point of attachment is to be. From this impression a plate can be made of whatever material you choose, which will as certainly be adapted to the palate as to the mouth, as the impression will have been taken over the palate when it was in place. The palate can be attached to the plate either by means of a key, as described in the November number of the Dental Cosmos for 1863, or by a split wire with a conical-shaped button on the end, that spreads apart as soon as it passes completely through the tube, or a simple gold wire with a bulb on the upper end, as we heard at Boston. For the sake of improvement, however, if each one making the instrument will do what he can to add to its perfection, and will give the results of his experience and ingenuity to the profession, that each may profit through the other, the unfortunates who apply to us for relief will be undoubtedly benefited by the results of such combined skill and liberality.

In the above description, while I believe that there are some things originating with myself, I cannot say that the most of them were not primarily instigated by others—the impression, for example, for which I am indebted to the politeness of Mr. Kingsley; and had it not been for numerous inquiries, both by letter and personally, relative to the construction of artificial palates, stating the difficulties that seemed to attend every effort to really acquire a practical knowledge of their construction, I should probably have done nothing in this direction, my *forte* not being Dental Art and Mechanism. Conceiving, however, that a simpler apparatus than the Stearns' palate, or even the Kingsley improvement, might be of service to a large number who are unable to pay $500 for relief, I have endeavored to modify the form and simplify the construction of such an instrument, so that, instead of requiring a "mechanician of the highest order" to make one, it could be made by any one capable of putting up nicely a set of teeth on rubber, and of taking the necessary impressions therefor in plaster. How well I have succeeded it is not for me to judge. I offer as a small contribution to my professional brethren, from whom I have received so liberally, the foregoing description, and hope that it may be sufficiently lucid to serve as a guide to any who wish to attempt the construction of a palate on this plan. The principle I believe to be correct, though in form and finish it may often vary considerably from what is therein described, as I have only given the plainest and simplest method that I know of giving the same amount of relief.

The French and English apparatuses are notably simpler than this, yet quite different from it; nor do I believe that they are nearly so efficient. I therefore have preferred to take a little more pains in the construction

of an instrument of this kind in order to add to it as much as might be of whatever is really valuable to the patient.

One strong incentive to the writing of this article has been the examination of the last edition of Harris' Dental Surgery, the DENTAL COSMOS for November, 1863, and August, 1866, and of Mr. Kingley's address before the Medical Assembly of New York, which, I am informed, is the same that was delivered before the New York Dental Society; and the fact of having been present at a four hours' speech, in Boston, on the subject of palates; in all of which, while I find much that is interesting, and much that is treated of in Carpenter's Physiology, and in works on Philology, and much in praise of one peculiar method of treating these cases, I still find no clear description of "How to do it." I do not know that I have succeeded any better, but there is at least a description in different language of the mode of constructing an artificial palate which, although not by any means "precisely the same as those constructed by M. Preterre, of Paris," yet contains several ideas that were given me by that gentleman, and which I wish to duly credit him with, viz., entire plainness and simplicity of construction; the union, if necessary, of hard and soft rubber in the same instrument; and lastly, though not mentioned before, the application of these instruments to children from eight years old and upward. In this latter respect, M. Preterre has, in my opinion, done a greater service to the class suffering from congenital cleft palate, than any other one man, either in Europe or America, for he has combated that prejudice which has denied to children, in the early formative stage, both of body and expression, that means of relief which is the more needed then, because far more effective than at a later period in life. How earnestly he has labored may be judged from the fact that his lady trains, or did do so, some of these children daily in vocal exercises, and his success with them can be regarded, all things considered, as even greater than that which he has had with adult patients, judging from several that I saw and conversed with at his rooms.

Should any portion of this paper prove obscure, I shall hope to supplement it at some future day, on becoming aware of its defects.

SUGGESTIONS FOR CONSIDERATION BY THE DENTAL PROFESSION REGARDING THE PREDISPOSING CAUSES OF CARIES OF THE TEETH.

BY DONELDSON MACKENZIE, M.D., TUNBRIDGE WELLS, ENGLAND.

IN the November number of the DENTAL COSMOS, Dr. Cushing, at a meeting of the Illinois Dental Society, makes some very judicious remarks upon the influence of the parents' health upon the constitution of the child. There is nothing new in this, as we all know that a nursing sow,

if fed upon madder, will, by the transmitted fluid, introduce color to the osseous structure of the nurslings. As a sequence, whatever food or drink is indulged in by the mother forms the aliment of the child, through the fluid which it abstracts from her. This being the case, it is much to be desired that women about to become mothers should duly consider the great responsibility then laid upon them; as, from the moment conception has taken place until lactation has ended, the infant is laying the foundation (if hereditary taints be excepted) of all its constitutional pleasures or pains.

Dr. Cushing defines the reason for the present prevalence of decayed teeth to be our removal from primitive or natural habits. Few can hesitate to subscribe to this conclusion, and to support it even to the condemnation of the malpractices upheld by social custom and many times recommended by medical advisers to nursing women.

I do not offer the following remarks as original, but rather as truths gathered from observation and the labors of greater men, added to experiences consequent upon a dental practice extending over thirty years.

Dr. C. suggests the necessity of mothers choosing bone-forming substances as diet. True; but in what category are we to place those bone-forming dietary substances? It would be rather hard to restrict a gestating or nursing lady, during those periods, to a diet of oatmeal porridge, which we know to be the most bone-producing material used as food, if we except the Scottish notion embodied in the lines:

"But mark the rustic haggis fed,
The trembling earth resounds his tread."

Animal milk contains all that is necessary to form the body; human milk containing more oil than that of other terrestrial animals, no doubt provided by nature as a means of heat, in the absence of the hairy or woolly covering of other animals. In our present inquiry, the object we have in view must be the best means of producing this fluid in its normal condition.

If we glance at the analysis of bone, under distillation, a small amount of fat and animal matter is separated, then we procure phosphate of lime, carbonate of lime, phosphate of magnesia; and as blood, muscle, and bone, in the first stages of existence, are all developed from the mother's milk or other infantile diet, it ought to contain substances productive of those salts.

Almost all the grain, and indeed most vegetables used as food, contain in a greater or less degree these necessary principles, as is proved by reference to the vegetable-feeding animals whose flesh we consider so essential to our health and existence. Whether the necessity for so much animal food as is generally taken be actually required, I shall leave to be decided by those who have given more attention to the subject than I have—only observing that, in the production of blood, unless the extra

amount of oil observable in human blood over vegetable-feeding animals is derived from that source, we only procure the other formative qualities second-hand from animal food.

Admitting all this to be understood, as of course it is, and that a proper and health-giving diet is adhered to, it should still be the care of the child-bearing woman and mother not to destroy the blood-producing properties of the food by indulgences which, at other seasons, could only injure one individual, not two.

I here allude to the extra indulgence in wine, spirits, or beer, which, in Great Britain and Ireland, is considered not only necessary, but almost a sacred right, by ladies in that interesting condition. Now, I believe it is patent to all educated persons that distilled spirits do not contain one drop of nutriment, and fermented beverages very little; and their introduction into the stomach during or immediately after meals, either retards or entirely puts a stop to the necessary process of digestion. We have the fact from high authority that when spirit in any form, wine or beer, is swallowed, a very large portion is carried into and mixed with the blood, where it supersedes the oil, and burns there in its stead, depriving that fluid of its building-up properties, and impairing it as a producer of muscle or bone.

Being entirely ignorant of the domestic habits of the ladies in America, I in no respect attribute this habit to them; but know it to be too much the practice in this country—innocently enough no doubt, and even advocated by the faculties—highly mischievous as it is to the fragile infant unborn, and also to the nursling, nevertheless.

A case in point came under my immediate observation. A lady of robust health during gestation of her first child, and lactation, indulged (advisedly) in stimulants. A fine healthy boy was born at the proper time, but much trouble was experienced during lactation from his having convulsive, passionate fits, to the constant fright and discomfort of parents and nurse. During gradual weaning these became less frequent, and, on entire weaning, ceased altogether.

From the earliest symptoms of the next interesting occasion, five years after, the lady, from her own inclination, adopted milk as her principal beverage; never tasting wine or spirit. The child very fine, tranquil in temper, large and strong; at the age of seventeen, six feet high, wide in proportion.

First-born, teeth given to caries; second, hardly at all. This episode I do not relate *as a rule*, simply as a coincidal circumstance. Both enjoy perfect health; the eldest, not so tall or large as a man; his teeth were early defective, which circumstance I should be greatly inclined to attribute to the alcoholic condition of his mother's milk. Indeed, when we take into consideration the direful effects which excess in alcoholic stimulants produces upon the adult frame, in what degree must we compute this action upon the fœtus or the tender suckling?

In the May number of the DENTAL COSMOS, which has just come to hand, I observe two or three useful extracts upon alcohol which somewhat bear upon my present subject, and I would further remind your readers of the powerful affinity between alcohol and water, and that, when once mixed, we know of no means of again parting them, unless by evaporation, distillation, or freezing; and also of the process of osmose, by which the blood receives water from the stomach direct, without passing through the alimentary process. When the blood requires diluting, the want is expressed by thirst. Many persons supply this want by swallowing brandy and water, or some other alcoholic mixture. Now, it is reasonable to suppose that from the impossibility of separating those fluids, the spirit with its admixture is carried directly into the blood-vessels of the brain, heart, and lungs; the spirit only to be got rid of through the medium of the lungs and through the pores of the skin.

In writing this paper, I do not desire it to turn out a lecture on temperance, but to induce an inquiry among my professional brethren, whether indulgence in stimulants by pregnant women and nurses is likely to prove inimical to the subject which is being produced and reared, or if under such circumstances the osseous structure is deprived of any of the substances which are required for its normal development?

THE CHARACTERISTICS OF THE BLOOD.

BY RUFUS KING BROWNE, M.D.

(Being Report of Remarks made before the New York and Brooklyn Dental Societies, on the Physiology and Pathology of the Circulation.)

IT remains with physiologists a question of no less moment than interest how the elements of the blood appropriate that portion of the air which is its oxygen, and hence, from which the tissues of the whole interior of the body, through which the capillaries penetrate and ramify, receive their supply. There is a question as to precisely what part this oxygen plays in the various processes of the body; whether, for instance, it chiefly supplies this element for a reduction of certain of the bodily substances to a removable state—the probable supposition of Beale—or whether it is an indispensable condition to the nutrition and sustentation of the tissues, or their normal state of nourishment; but there is no question that oxygen from the air does, in some way, regularly find its way into the system in certain measurable quantities. The organ through which this is accomplished is, of course, the lungs; but between the air in the lungs and the blood in the capillaries of that double organ there is an appreciable distance and wall of separation. The blood flows in a closed tube, while between the surface of that tube farthest from the blood and the air in the lungs there is, in addition, a membranous expansion of epithelial cells, constituting a second wall.

It is easy to believe that the oxygen of the air, entering the lungs, breaks away bodily from the nitrogen with which, in combination, is formed the air; and, bodily, in a continuous stream or ingress of atoms, penetrates directly through these two walls which partition the air from the blood, to enter into combination with some element of the latter, supposed to be one of the sets of blood-globules. But the supposition has never yet been ascertained to be a fact.

Admitting, therefore, our want of *complete* certainty as to how oxygen enters the blood directly, if, indeed, it does so *directly*, I propose to speak of what we know of the blood, and of the changes it undergoes during its circuit; and the variations in physiological character it assumes as it proceeds through the different sets of vessels.

The blood receives its main impulsion from the heart, a hollow muscular organ, whose hollow and structure is continuous with that of the arteries. This impulsion consists of the contraction of the walls of its two largest chambers or cavities, the ventricles, which have been filled by the contraction of its two lesser chambers, the auricles. The right larger chamber, incessantly receiving the venous blood from the innermost and outermost parts of the system, passing through and being contracted on by the auricle, impels it by its contraction to the lungs—which is to a different part of the system whence it came—while the left large chamber, receiving the now arterial blood coming back, but by a different route, to the heart, impels it into the arteries, which continue to impel it onward by their contractions. If the arteries be followed to their minutest ramifications they will be found diminishing in size as they branch, their walls becoming thinner, until, at last, they become exceedingly attenuate membranes, surmounted at intervals with oval nuclei. This is the capillary part of the blood tubes. This membrane is about the 25,000th of an inch thick. The diameter of these vessels differs in different tissues from the 1000th of an inch to the two thousandth. It is only the largest of them which admits the passage of a blood corpuscle without change of form. The capillaries penetrate between the anatomical elements, and never *into* them. In some organs, the liver for instance, the capillaries constitute actually the great bulk of the organ, and, when injected, seem to leave no place for the liver ducts and cells. The phenomena of the capillary circulation are only observable with the aid of the microscope. This truly inspiring spectacle, wherein we seem to penetrate to a glimpse of the very tide of life, was first observed by Malpighi. We see the great torrent of arterial Hudsons, and Amazons, and Mississippis rushing forward, within the reach of the capillaries where the corpuscles dart along in Indian file. In vessels of considerable size, as well as the capillaries, the corpuscles, occupying the central portion, move with much greater rapidity than the rest of the blood, leaving a layer of clear plasma along the sides quite stagnant.

Sometimes a red corpuscle becomes involved in the still layer, when it moves slowly, turning over and over, or even halting for a time, until it is again taken up. A few white corpuscles are constantly seen in this layer. They advance hesitatingly along, sometimes touching the side of the vessel.

Sometimes two single rows of corpuscles may be seen passing in two capillary vessels, of equal size, directed toward a third vessel; the corpuscles in one of these are held back until the others have passed in.

The movement in the capillaries is always quite slow. The corpuscles do not circulate equally in all the capillaries. Sometimes a capillary will not receive a corpuscle for some time, but soon after they may flow through it. And a corpuscle is frequently seen curved and delayed at the angle where one capillary branches in two, to afterward dart forward. The rate of circulation in the capillaries is subject to great variations, and the scene is changed with every part examined. In the lungs the large polygonal air-cells are bounded by capillary vessels, in which the corpuscles rush forward with marked rapidity. Here the larger vessels are crowded with corpuscles, leaving no still layer next the wall. The rapidity of the flow of the blood is, however, by no means as great as appears in microscopic examination, being exaggerated in proportion to the magnifying power. The rate is probably about one-fortieth of an inch per second.

In the arteries the blood progresses invariably in one direction, that of the trend of the artery, but in the capillaries it spreads in diverse directions over the capillary area. The blood in the arteries is separated entirely from the column in that of its fellows, but in the capillaries it merges upon a common, though channeled and anastomosing set of hollows. The capillaries appear to be a homogeneous membranous tube; but they are subject to considerable variations in their calibre and size, during the incidents of the circulator. Of this there can be no doubt. The flow of blood in these vessels is induced by the propulsive contractions, first of the heart, and next of the arteries. As the tissues and the organs advance toward maturity, the blood becomes of vast importance, and it is not possible to discuss, even cursorily, the general change in the system without referring to the character and physiological composition of the blood, and the changes that are taking place in it during every moment of existence.

Although the chemical components of the fluids of the body are many, the blood alone yields the various materials required for the formation of the tissues and the organs, and for maintaining them in a state of nourishment after the formation is complete; and through its agency all the substances resulting from the disintegration of textures which have already performed their work, are carried to the different parts of the body where their removal is effected.

The blood must, therefore, be considered as the medium by which at the same time nutrient matters are carried to every part of the system, and the products resulting from decay brought to the points at which they can be discharged.

The consideration of the chemical changes taking place in the blood will comprise some of the most important chemical phenomena occurring in man.

Anatomically considered, the whole blood consists of a viscid liquor called the plasma or liquor sanguinis, and two sets of free and moving bodies, of rounded shape, called the *white* and *red* corpuscles. Both of these not only move with, but *in* the liquor and at a perceptibly different rate of progress.

Physiologically, the constituents of the blood may be divided into—

1. Inorganic constituents. These exist in a state of intimate and molecular union with the organic nitrogenized elements. These are all held in solution in the blood, since after incineration, the chlorides, sulphates, phosphates, and carbonates are found, with sodium, potassium, magnesium, lime, and iron.

2. Non-nitrogenized constituents. These are the sugars and fats.

3. Organic nitrogenized principles. These constitute the greater part of the blood.

Most of the constituents of the blood are found both in the corpuscles and plasma. It has been shown by Schmidt, of Dorsat, that the phosphorized fats are more abundant in the globules, while the fatty acids are more abundant in the plasma.

The potash salts have been found by the same observer to exist almost entirely in the white corpuscles, and the soda salts are four times more abundant in the plasma.

The proportions of the various constituents of the blood are subject to great variations, but in addition to what may be truly called the nutritive principles of the blood, we have also in it urea, cholesterine, creatine, creatinine, and some other substances.

Aside from the gases, we have as constant or temporary constituents:

Sugar.

Fatty Emulsion.

Coloring Matter of Serum.

Urea. Uric Acid.

Bernard showed, in 1848, that sugar always exists in the blood of the hepatic vein, and the right side of the heart. It is made in the liver and disappears in the lungs.

Bernard has also shown that the blood of the hepatic vein contains an emulsive substance formed in the liver.

Urea exists in very small quantity. Discovered by Provost and Dumas.

The most important substances of the blood are the fibrin and albumen. The first coagulates spontaneously when the blood is removed from the living organism.

The other is in a state of solution, but on the application of heat, or upon the addition of a mineral acid, it passes into an insoluble condition, forming a white clot or coagulum.

Albumen is so called from the white color it possesses in its solid coagulated state. The blood contains 30 per cent. of albumen.

Fibrin exists in a state of solution in the blood, forming, in this flowing state, with the serum of that fluid, the liquor sanguinis, or plasma

When blood is drawn from its natural channels and allowed to rest, it speedily separates into a solid portion, the clot, and a fluid portion, serum. The clot of the blood consists of the intertangled filaments of fibrin into which the first flowing fibrin has passed, with the white corpuscles and red globules entangled in it during its coagulation.

It sometimes happens that, owing to an unusual aggregation of the red particles together, and to their very speedy subsidence, a portion of fibrin on the surface coagulates without inclosing the coloring matter, the buffy coat. It is simply the nearly colorless fibrin, containing the white corpuscles.

Fibrin, in a state of purity, may be obtained by cutting the clot into slices, and washing parts in clean water, so as to dissolve out the coloring matter; or by briskly stirring with a bundle of twigs blood as it flows from a vessel.

Sometimes we obtain masses of fibrin, great part of which is colorless, from the cavities of the heart, and from the large arteries after death. It is also accumulated and disposed in lamellar form in the sacs of old aneurisms.

Pure fibrin is white, tasteless, and inodorous. Under the microscope it is seen to consist of fibres crossing one another at every possible angle, and interlacing in all directions, and numerous white corpuscles.

If fibrin be dried it becomes yellow, hard, and brittle. It is insoluble in hot and cold water, and alcohol and ether. Strong acetic acid converts it into jelly-like masses, sparingly soluble in water. A solution of nitrate of potash, in the proportion of one part to five of boiling water, readily dissolves fibrin ; and any of these solvents of fibrin will prevent the coagulation of blood which has been allowed to drop into it as it flows from the blood-vessels.

Fibrin is dissolved by cold concentrated hydrochloric acid, and if kept at a cool temperature for forty-eight hours, the solution acquires an indigo-blue color. Albumen, similarly treated, acquires a violet color.

Caustic potash, chloride of sodium, carbonate of potash, and many other neutral salts have the property of retarding the coagulation of fibrin.

Dr. Richardson supposed that the fibrin was held in solution by the am-

monia present in living blood. But although there is no doubt that this substance will prevent the coagulation, there are many facts opposed to Dr. Richardson's view. Observers have not succeeded in detecting even free traces of ammonia in fluids in which fibrin existed in its uncoagulated state.

Observations have shown that coagulation is far more rapid in arterial than in venous blood. It differs with different animals. It is particularly rapid in classes of birds, in some of which it takes place almost instantly.

Shortly after blood is drawn, it coagulates or "gets" in jelly-like masses. In a few hours we find that contraction has also taken place, and the once apparently homogeneous viscid red fluid has separated into a solid portion, the clot, and a liquid called serum.

The latter contains all the elements of the blood, except the red corpuscles and fibrin which together form them, though the clot retains or holds, according to Milne Edwards, in most substances, one-fifth of the entire volume of serum.

As a general rule, when the coagulation has been rapid, the clot is soft and slightly contracted.

As in the body, fibrin and albumen are in combination, and the organic principle of the serum (albumen), when injected into the vessels of a living animal is not assimilated, but is excreted by the kidneys.

The *red corpuscle* of the blood seems to be composed of a very small portion of soft matter of very viscous consistency, very slightly soluble in ordinary fluid, but capable of undergoing solution in the serum under certain circumstances.

We infer this from the fact that, in some animals, the red matter retains its colloid, semi-fluid state, only while it is kept in active motion, in the circulation.

The red corpuscles of the guinea-pig pass into a crystalline state within half an hour after they have been removed from the vessels, and without the addition of any reagent or solution whatever.

It is certain, at least in this case, that there is no rupture of membrane and escape of contents.

For in these cases the small mass of viscid matter, of which each single corpuscle is composed (is a lifeless chemical substance), may be seen to form a single crystal, while, if the corpuscle be slightly warmed, they break up into many small portions, each of which assumes the tetahedral form.

It was, until very recently, considered that the matter which enters into the formation of the red corpuscle consisted of two substances, hematin and globulin, but late researches show that in the natural condition there is one chemical substance, which, however, is readily decomposed.

This has been termed globulin. But of this important subject I shall speak again.

(To be continued.)

DENTITION; ITS PATHOLOGICAL AND THERAPEUTIC INDICATIONS.

BY GEO. W. ELLIS, M.D., D.D.S.,
LATE PROFESSOR OF DENTAL PHYSIOLOGY AND OPERATIVE DENTISTRY IN PHILADELPHIA DENTAL COLLEGE.

(Continued from page 635.)

We are fully aware that the malarious influence, either through deficiency in quantity or concentration, or the absence of favoring circumstances, may exist in the system and impress concomitant affections with the intermittent or remittent type, and even generate local disturbances characterized by the same peculiar periodicity.

Hence we not unfrequently meet with periodic toothache, periodic neuralgia, etc., which readily yield, independent of any local interference, to the judicious administration of those remedies so eminently corrective of this habit. Says Dr. Richardson: "Often when least suspected, this poison is doing its silent work, and teeth are not unfrequently sacrificed to its fury which in structure are as sound as unbroken enamel or dentine can make them. I remember some years ago being painfully impressed with this fact. * * During one season I was constantly having under treatment some of the inhabitants of this locality for toothache. I am afraid that under pressure of solicitation and in ignorance of the cause that was at work, I drew more sound teeth than diseased ones for the people of this place."

The cause of this difficulty was discovered to be a foul untrapped sewer, the emptying and cleansing of which was accompanied by the simultaneous disappearance of neuralgic pains.

The continued operation of such a noxious element tells fearfully upon the health and strength of a fragile infant, seriously interfering with dentition, causing its retardation, difficult eruption, and the formation of teeth inferior in the quantity and quality of their tissues.

If such undesirable results can be reasonably suspected to originate from residence in an infected district, the welfare of the child is best consulted by its removal to a more healthy locality, at least from the first of July until the occurrence of autumnal black-frost; for although miasmatic fevers can be in the majority of cases controlled by the exhibition of quinia and its preparations, the propriety of impregnating the system with drugs at such an early age (to say nothing of the same course in later life) is at least questionable.

True, there are some who, through acclimation or medicinal influence, lose their susceptibility to the exciting cause; but my limited experience convinces me they are exceedingly few; and even where the ordinary train of symptoms is absent, not unfrequently the system is contaminated, as evinced in the occurrence of vicarious disorders or the existence of a general anæmic condition.

Circumstances, however, are sometimes such as to preclude migration, when it becomes necessary to adopt the next best course, by cautioning against unnecessary exposure to the cause, and administering remedies calculated to protect against the disease or eradicate it when established.

When compelled to remain, it is important to scrupulously avoid the early morning or late evening air, to sleep in closed apartments, well ventilated during the day, to guard against intense noonday solar heat, and avoid sudden changes of temperature; in addition to these sanitary observances, great benefit is derivable from keeping the system gently and steadily under the antiperiodic and tonic influence of Peruvian bark or quinia.

There exists a great prejudice in the minds of some against the use of quinia, which, while free from the vast majority of objections urged against it, is, nevertheless, when injudiciously, heroically, and perseveringly used, productive of certain undesirable results; hence other remedies have been tested with the view of obtaining, if possible, its advantages independent of its objectionable features. This desideratum, it is believed, is partially secured by the use of chinoidine.

This material enters into the composition of a patent medicine which has received high encomiums for its efficacy in promptly curtailing attacks of fever and ague. Its use in the profession has not been extensive, yet I am induced from a very limited experience to entertain strong hopes of its virtues in the treatment of infantile miasmatic fevers. Three grains of the extract are equivalent to about one grain of quinia. It may be administered in the following form:

R.—Chinoidine, gr. iv;
Ext. gentianæ, gr. i.
Misce. Ft. pil. xii.
S. Take $\frac{1}{2}$ pill every three hours.

In combating this, as in any other disorder, it is necessary to exercise a strict surveillance over the various important functions, in order to maintain their integrity or correct them when deranged.

Other remedies have been lauded as beneficial in this disease, among which may be mentioned sulphate of copper, sulphate of zinc, salts of iron, ipecac, tartar emetic, sulphur, alum, tincture of iodine, sal ammoniac, common salt, dogwood bark, wild-cherry, horsechestnut, and willow bark; salacin, nux vomica, sulphate of bebeerin, narcotina, charcoal, spider-web, opium, boneset, brandy, musk, ether; and when we reflect that the list includes many others, we will with reason suspect that every remedy in the pharmacopœia may be tortured into an applicability in this affection.

Of course, in dealing with infants the principle of faith cannot be made available; yet let me here remark, that in the treatment of adults it is un-

questionably an invaluable adjunct, and oftentimes succeeds when medication fails. The principle has been employed in a number of ways; as by ascribing to certain trinkets or charms the power of expelling the disease; the plan of placing forward the hour-hand of a clock so as to impress the patient that the time for the chill has passed; the assurance obtained from certain individuals who are vulgarly accredited with a supernatural influence. Dr. Gregory related a case which occurred in the clinical wards of Edinburgh, where the patient with many ceremonies swallowed a slip of paper with some word inscribed upon it, and thus obviated another paroxysm.

I recall a case that was related during attendance upon a course of clinics conducted by Prof. Carson, of the University of Pennsylvania, where a woman, more credulous than educated, presented herself for the treatment of a difficulty which she located in the chest; in the course of diagnosis the stethoscope was employed, and the patient dismissed, that her case might receive further consideration; upon the recurrence of clinic day, she again appeared and strongly protested against taking the physic which the doctor prescribed, urging a second application of the "instrument," which she contended had caused great amelioration of her suffering; by indulging this blissful ignorance, a few applications of a simple "wooden tube" proved sufficient to effect a cure—a fact confirmed by the thankful expressions of the patient.

From these circumstances we become convinced that in "bread pills" there is really a potency, and can readily perceive how a practitioner is justified in the occasional employment of an inert remedy or indulgence in prevarication, and, however reprehensible a "white lie" may be considered by the moralist, the welfare of the patient and the commendable designs of the physician combined form, to my mind, strong argument in favor of the doing of a little evil that great good may result therefrom.

Permit me to continue this divergence far enough to remark, that we cannot impress intelligent patients with an idea of our competency unless we possess the acquirements to warrant it; for the difference between an assumed erudite air and the demeanor sustained by solid information is as palpable to the discerning mind as are the alternations of light and darkness to sensitive vision; and it is impossible to make available the treatment to which reference has just been made, without first enlisting entire confidence; this secured, you may rely upon the implicit observance of all directions, and, coupled with the influence of "faith," results will be wrought wonderfully gratifying and expeditious.

Here lies the secret of the peculiar success attending certain practitioners: while a patient will constitutionally degenerate under the attendance of one adviser, he will as constantly recuperate under another, although the remedies used and their method of administration be the

same; this is a result which I have so frequently witnessed that it ceases to present the appearance of simple coincidence, and in searching for a reason, I can discover no talisman other than the possession of self-confidence and a superior will-force which, for the time being, absorbs, incorporates, or identifies that of the patient.

We will now notice the last of the prominent causes operating detrimentally upon dentition, which consist of food defective in quantity, quality, or both; of unwholesome air, improper clothing, want of exercise, etc.

You will recognize in these causes that which would be calculated to occasion derangement of the adult system, and hence how much more deserving of attention as sources of infantile disease.

In the consideration of this part of our subject, it is difficult to preserve a course in strict harmony with all writers or lecturers who have investigated the subject, for a great diversity of opinion exists; we shall try, however, to present the facts generally accepted, and will draw upon the able work of Dr. Williams, where the matter is very tersely treated.

The utility of a proper proportion of organic elements for the food of animals has been conclusively shown by Dr. Prout, who indicates milk as the type of proper nourishment, containing as it does albumen, oil, sugar, and water; all other articles of diet, in order to meet the requirements of the economy, should contain the same elements, or others isomeric (that is, of identical ultimate composition), as do, indeed, all customary combinations of food.

Bread contains two of these, gluten and starch; but without the fat or butter, it is not relished; so meat, which contains albumen and fat, will not supply the demands of the system without a combination with some of the vegetables which represent the amylaceous or saccharine principle.

It is interesting to examine at length the discussions upon the office which each element of food performs in the economy, and the extent to which they are metamorphosed by the processes of digestion and assimilation. Our subject, however, will confine us to a simple notice of the different principles which compose our diet.

The chief alimentary matters are the albuminous, gelatinous, oleaginous, and the saccharine or amylaceous.

We are aware that during the progress of dentition the diet is constantly modified in order to meet the indications presented by nature; when the teeth assume a certain degree of prominence and fixedness, animal food may not only be indulged in without injury, but is plainly and forcibly demanded by their presence; yet of course in quantity and quality proportionate to the comparatively weak and undeveloped condition of the alimentary organs.

Albuminous or *proteinaceous* articles are such as the lean of meat,

fowl, fish, the gluten of bread, and the casein of milk, which supply the blood and textures of the body; hence a defect of this kind of food at first occasions weakness and atrophy of the muscular system, and deficiency in the quantity and richness of the blood; then excess occasions, on the contrary, a plethoric condition, while a bad quality of the same proves injurious especially to weak digestive and assimilative powers.

Gelatinous food, such as soups, broths, isinglass, jellies, etc., are less supporting than albuminous matters; alone, they are but very triflingly nutritious, yet in combination with bread and meat, they constitute a nourishing element.

Oleaginous or *fatty* matters, as butter, fat of meat, oils, or seed containing them, furnish material for adipose tissues, other structures and secretions, and have been regarded by many physiologists as the combustive element which sustains the normal temperature of the body by its oxidation.

Amylaceous or *starchy* food, such as arrowroot, sago, tapioca, and other farinaceous articles, and also the saccharine matters, are deemed but slightly nourishing, and especially subservient to the process of respiration; in excess, they may increase the quantity of fat, or, by fermentation, generate irritating and injurious acids, the latter being especially the case with sugars. The tendency of an excess of starchy food is to impair the action of both the liver and intestines, occasioning a constipated condition of the bowels, while the sweets in excess are prone to produce precisely an opposite condition of things—a redundancy of bile and a relaxed state of the bowels; they form the mildest articles of food, and serve to dilute and render more palatable and digestible the fibrin and oil; when deficient, therefore, the latter are more likely to disagree, and less apt to impart their nutrient properties.

From these facts, we observe that the selection of a diet proper in all respects would involve much scientific knowledge and investigation, but happily nature has endowed us with an appetite and discriminative taste which enables us instinctively to select the proper kinds of nutriment, and in proper proportions.

We must, however, bear in mind that, by being pampered with palatable but injurious articles, it may become so perverted or depraved as to clamor for the wrong and discard the right, a course of proceeding which will eventuate in the substitution of sickness, disease, and misery, where health, vigor, and happiness only should reign.

It seems almost unnecessary to consider the effects of a deficiency in general nourishment, or starvation, yet often when a child may be considered best fed, the elements of the milk may be so inferior as to possess little or no nutritive properties; when any such difficulty exists, it is manifested by the voracious appetite, general weakness, and a wasting of all the textures except those of the nervous system. Says Dr. Williams:

"The blood becomes thin and easily extravasated; the gums spongy and bleeding; fat disappears; muscles become thin and flabby; the legs edematous; diarrhœa often occurs; ulcers appear in the cornea and other parts which are least vascular; a state of scurvy or cachexy is induced, from which, if advanced, an improved diet may now fail to restore. In less extreme cases, poor living may excite scrofulous and tuberculous disease, and other kindred forms of degeneration of organs.

"Chossat has shown that by nourishing any animal insufficiently, instead of totally depriving him of nourishment, the period of death is delayed, but it does not change the law that death occurs sooner or later inevitably. In both cases the animal dies as soon as his weight attains the limit of diminution compatible with life."

Dr. John Clarke says: "It cannot reasonably be maintained that a child's mouth without teeth, and that of an adult furnished with teeth of carnivorous and granivorous animals, are designed by the Creator for the same sort of food." Yet, notwithstanding the indications thus so clearly manifested, the habit still prevails of feeding children with food unfit for their immature stomachs, and that in quarters where the influences of education ought long ago to have dictated the abandonment of a practice so prejudicial.

The influences of food, when spoken of in this connection, must necessarily be exerted systemically, and a child treated with indigestible and irritating matters, must suffer not only through the deficient assimilation, but also from organic disturbances, which, generated in so important a viscus as the stomach, must, if continued, exert a deleterious effect upon other organs and tissues, and we cannot say how much upon the growth of the maxilla and their contents.

It has been remarked by those conversant with this subject that if a very young infant of high nervous susceptibility be fed on any other food than human milk, an immediate diarrhœa ensues, with rapid emaciation and a depressed aspect of countenance. Now much stress has been laid upon the injurious tendency which an unhappy facial expression exerts upon the modeling of the jaws, and probably not without some show of reason, for perfect health requires freedom from mental anxiety, and its index a cheerful physiognomy, and nothing is certainly more incompatible than indigestion and happiness; consequently we may have a double influence at work—alimentary disease and the distorting force of unduly exercised muscles.

There are, however, other ways in which improper feeding precludes normal maxillary development, and the principal one is by disarranging the relationship which exists between the masticatory muscles and the muscular structure of the stomach; the balance is destroyed, and the latter is obliged to vicariously assume the offices of the former, and perform duties inconsistent with its anatomical formation.

According to Bichat: "In the carnivorous animals, the muscular appa-

ratus of the stomach has a development bearing an inverse proportion to the muscles of the jaws, and it is rational to expect in man, whose diet consists in part of animal food, a masticatory apparatus capable of some execution."

The tempero-maxillary articulation is such as to permit of a variety of motion, and in the act of sucking, as in the comminution of food, the various muscles are brought into play, and the normal development of each depends, no doubt, in some measure, upon the shape of the body taken by the mouth and the amount of force exercised thereon—hence the results upon the jaws, mouth, and tongue; for these muscles cannot be the same when spoon victuals are substituted for the nipple.

Besides, there are associated organs, which derive their exercise, as it were, from the surrounding musclar activity; such, for instance, are the salivary glands, mucous follicles, blood-vessels, nerves, and absorbents, and thus we observe that a single indication omitted may establish an extended derangement, which will necessarily interfere with the correct growth of the jaws.

If the function of any organ be arrested, its growth is retarded; in some cases it atrophies, and some other organ is unduly developed to supply its place. If this deficiency exist in the organs of mastication, the stomach may become the part subjected to morbid growth, and from such unnatural condition again recoupe upon the development of the jaws.

ROOT PLUGGING.

BY A. F. M'LAIN, D.D.S., M.D.

Read before the New Orleans Dental Association.

Few dental practitioners of experience can have failed to observe with what pertinacity some members of the profession continue to adhere to obsolete theories and modes of practice which have been condemned by the light of science and of philosophy.

It would indeed be a work of supererogation to advert to such professional errors, or, in other words, malpractice, were it not for the evils which too often result from them—causing much pain, and quite frequently necessitating the actual sacrifice of valuable teeth in order to obtain relief.

It will suffice, however, merely to mention the pernicious habit which many dentists have of stuffing with cotton the pulp cavities or canals of teeth, after destruction of the pulp, preparatory to the insertion of a filling.

Those who have adopted this method of practice, endeavor to obviate future difficulties, by previously saturating the cotton with crea-

sote; but this is fallacious, for, if the pulp has been extirpated, the canal to the apex of the root being open, or impartially closed, percolation through and into it, of liquor sanguinis, blood, or other fluids follow, resulting ultimately in decomposition, or slow combustion: or a species of eremacausis—if such a term can be used to indicate the changes which take place—is induced. Gases are generated in the teeth, which, if not allowed to escape, become sources of irritation at some period more or less remote, and induce periostitis and alveolar abscesses. On the other hand, when the pulp has been permitted to remain, decomposition and the consequent evolution of the gases become more rapid and intensified by the increased quantity of decomposable animal tissues, notwithstanding the previous application of what was considered to be a preservative.

Could the foramen in all cases be reached, so as to seal hermetically the opening, preventing the escape of gas, pus, or any other fluids, should they be formed, into the alveolar socket, the result just mentioned would be of less frequent occurrence.

It is well known that, with the utmost care in manipulating the best material yet discovered for such purposes,—I mean gold,—and in the hands of experts, too, the operation of filling *pulp* canals, especially in bicuspids and the roots of inferior molars, is at best imperfect if not a complete failure—due, however, in most cases, to the sinuosity of the roots, or to the flattened condition of their canals.

Although all vegetable tissues are objectionable on account of their porosity favoring absorption, the plan advocated some years since by a correspondent in the DENTAL COSMOS, of whittling down a piece of wood, such as flexible hickory, for instance, to suit the size and length of the canal, then pushing it up to the end of the root—observing, however, the necessary precaution not to allow it to pass through—is far less objectionable than the use of a substance of such a fibrous texture as cotton.

Having seen, then, that the exhalation of gas or the escape of fluids into the alveolar socket is a prolific source of irritation and consequent inflammation, the proper filling of a root or roots becomes a matter of much importance, involving of necessity the thorough closure of the foramen. How that end is to be attained, whether the gold is introduced by wrapping it on a broach or by means of long cylinders, is of little moment, provided the object be accomplished. It would be absurd to prescribe to operators the precise manner of proceeding in their manipulations, inasmuch as each one may obtain the best result by following a mode peculiar and most easy to himself; but what is insisted upon is thoroughness as far as practicable in entire removal of the contents of the canal, and subsequent filling of the cavity with gold, as being essentially necessary in contributing toward success; though sometimes, from constitutional or predisposing causes and the condition of the patient at the time, some efforts may result in complete failures.

I would not disparage the beneficial effects which may be derived from the use of antiseptics in such cases, for, should they do no good, their presence could not possibly exert any bad influence; and as a precautionary measure, it would perhaps be as well, before the introduction of the filling into the root, to inject the canal, by means of lint or cotton wound on a broach, with a preparation consisting of a grain or two of iodine dissolved in half an ounce of chloroform, to which is added from one-half to a drachm of creasote, but taking care not to force the solution through the foramen. Furthermore, in order to retain more of these ingredients in the canal, the first piece of gold may be dipped into the solution, and the operation concluded in the usual way. This plan has yielded in my hands as good results as could be expected, acting not only, theoretically speaking, as an antiseptic and absorbent, but as an anodyne, particularly when a slight degree of sensitiveness remained after the removal of the pulp. But in cases of sensitiveness the operation should be deferred, and much advantage may be gained by treating the tooth for a few days with the above mixture, which may be rendered more efficacious by the addition to it of twenty to thirty drops of Fleming's tincture of aconite. Perhaps the substitution of pure carbolic acid in lieu of creasote would be more beneficial as an antiseptic, inasmuch as the latter, although existing in combination with carbolic acid, also contains paraffine, eupion, and two or three other principles, possessing no antiseptic properties; beside, it is liable to contamination with pyroligneous acid, when manufactured from that substance, and sometimes it is adulterated with essential oils.

While discussing the subject of root filling, I trust it may not be deemed irrelevant to consider whether the immediate plugging of the canals after the removal of pulps—a practice almost universally pursued—may not be the cause of the failures which are occasionally met with, when no bad symptoms apparently existed at the time of the operation. It is true that when much hæmorrhage supervenes, a short respite is allowed the tooth; but as a general thing, if the bleeding is but slight or partially checked, the filling is introduced at once.

Now does such proceeding accord with sound physiological principles? It is an incontrovertible fact, that more or less blood combined with plastic lymph naturally exudes from cut or lacerated surfaces, the first forming a clot at the point of the incision or rupture, while the latter, by the reparative force of nature, in attempting to heal the breach, becomes a glutinous mass. This process, in favorable cases, occasionally terminates in the absorption of the effused matter and the consequent restoration of the part; but more generally, degeneration into pus, with the usual concomitants, is the result. Then, is it not reasonable to infer that their presence, by exerting pressure, causes more or less disturbance in the circulation of the adjacent parts? Were this not possible, it would be difficult to explain the cause of the soreness which so often ensues after a tooth has been thus treated.

Taking this view of the subject, we are naturally led to the conclusion that the better practice would be to wait in most cases, when the opportunity is afforded, for the subsidence of all excitement, and until absorption takes place, which may be expected in a few days; the pulp cavity in the mean time being kept closed, previous to the operation of filling.

PROCEEDINGS OF DENTAL SOCIETIES.

PROCEEDINGS OF THE ODONTOGRAPHIC SOCIETY OF PENNSYLVANIA.

BY THOS. C. STELLWAGEN, D.D.S., A.M.

A MEETING of the Society was held on Monday, June 3d, 1867, at the Philadelphia Dental College.

The President, Dr. William C. Head, in the chair.

The following paper was then read and ordered to be published with the proceedings of the Society:

MORGAN'S "PLASTIC GOLD."

BY J. FOSTER FLAGG, D.D.S., PROFESSOR OF "INSTITUTES OF DENTISTRY" IN PHILADELPHIA DENTAL COLLEGE.

In deviating from the usual subject-matter of my communications, and entering upon considerations pertaining strictly to manipulative dentistry, I do so impressed with the conviction that the material to which I call attention has an importance for the welfare alike of our profession and the community which warrants any personal risk as to judgment and reputation that I may incur.

It is well known to my brethren that I have for many years endeavored to advocate the *use* (in contradistinction to the abuse) of *all* such filling materials as seemed to possess qualities peculiarly adapted to subserve given purposes, and that it is no unusual practice with me to employ cotton, gutta-percha, oxy-chloride of zinc and gold (either sponge or foil), or amalgam, in the operation of filling one treated tooth; this I do, believing that I make a *better* result, in view of all considerations, than could be done in any other way.

I have long opposed the theories of amalgam ptyalism, and have lived to see the enlightened members of the profession, as a mass, ignore this folly. I have wrought with foil as ribbon and as rope, as cylinders, as pellets, and piece to piece, endeavoring to test the truth or fallacy of the arguments in favor of each form. I have used ounce upon ounce of sponge and crystallized gold, not deterred from its employment, but only rendered more cautious by an occasional "blued tooth," most of which, and *perhaps all*, I have found to occur from some defect in my manipulation, and obtaining oftentimes results which years of service have proven to be due to peculiarities rendering the material applicable to

certain cases. I have essayed again and again to obtain from the Cadmium alloys the benefits which were indicated as possible from the qualities of that metal, but here failure has been so universal as to lead me to their entire abandonment, at least for the present.

I recognize to the fullest extent the value of our gutta-percha materials (Hill's stopping, etc.), and feel the almost daily necessity of the employment of the oxy-chloride of zinc (so called) compound, but I do this, endeavoring to hold constantly in mind the deficiencies as well as the virtues of these articles.

Advocating these views, and able to point to a fair share of comfort, utility, and consequent satisfaction in the practice which I represent, it may be well imagined with what feelings I hear gentlemen enunciate the statement that "they use nothing but gold !—nothing but *foil!—never* amalgam or *bone* filling!" Just as though this were proof of their strength, *instead of their weakness.*

It was with a knowledge of this willingness upon my part to test persistently, patiently, and impartially, filling materials, to listen to suggestions upon manipulation, to examine forms of instruments, to admit of possibility of much improvement, and to desire it as much as recognize it, that the "plastic gold" was placed in my hands by its manufacturer, for the testing of its qualities, and information as to its demerits and merits.

It was given me by Mr. Morgan, with the assurance that it contained nothing which was injurious to tooth-substance; this it was satisfactory to know from the statement of one whom I had been accustomed to regard as perfectly reliable during an acquaintance of more than twenty years, and naturally prepossessed me to that extent in its favor; but when I found, in addition to this, excessive ease of manipulation (markedly so in difficult positions), rapidity of filling, peculiar adaptability to sides and *edges*, ease of finish, requisite solidity, capability of high burnish, beauty of color, absence of crumbling, thoroughness of compacting (as evinced by filing, burring, or chiseling into plugs), and freedom from waste of material, I thought it best to submit it to other hands, lest my admiration should entirely subvert my judgment.

The result has been that some of the best operators of this city have abandoned entirely the use of gold in any other form, and among these, some of our most exclusive advocates of *foil.*

Of course, too short a period of time has elapsed since the introduction of this gold to permit of any opinion as to its capability for *permanently* preserving teeth.

Gold foil has, with the best operators of every country, held decided pre-eminence, and it is not to be lightly put aside; *but the difficulties of its working, together with the greatness of its reputation, has rendered it the medium for more worthless results than those from all other materials combined.*

This it is which has led to the desire, upon the part of every true *dentist*, that a substitute should be found possessing the desirable attributes of well-worked foil, together with the possibility of utilizing these attributes with that amount of skill which has been bestowed upon the hundreds, instead of the tens, that thus, as a mass, dental operations might confer more benefit upon humanity, and, in return, reflect more credit upon the profession.

One trial of "plastic gold" is sufficient to convince that a like amount of skill can produce an equal result with much greater ease than with foil, and it is therefore fair to assume that a less degree of skill will relatively produce a greater proportion of satisfactory fillings, and I think the day is passed when advocates can be found who would argue that *difficulty* increases the path of *usefulness* in any direction.

This gold should be picked in moderately large pieces, introduced into the cavity by means of thumb-pliers (foil forceps), and *not picked up with the condensing instruments;* in deep cavities, introducing a piece sufficiently large to secure its own maintenance; in open cavities, securing the first piece by means of an indentation termed a "retaining point."

Instruments of blunt points, with shallow serrations, are best adapted for its impacting, and the ordinary filing and burnishing of foil plugs complete the operation.

If, in consequence of dampness, either from breath or moisture of atmosphere, or as the result of the want of freshness, a rigidity or other qualities detrimental to satisfactory working present themselves, they are removed by heating the entire mass upon a mica, porcelain, or metallic plate, or passing each piece rapidly through the flame of a spirit-lamp (in either case avoiding a temperature sufficiently high to produce redness); this, however, should not be done unless absolutely necessary.

In calling the attention of the profession to this gold, I do so the more decidedly because I believe that, in common with many others, I know the requisites of a filling material; have had an amount of experience which would warrant an *apparently* hasty opinion; *would do wrong not to afford extended opportunity for the trial of an article which promises so much*, and have no fear of publishing just as extensively that unfortunately I was in error, should "time" prove the hopes I have indulged in to be unfounded.

Dr. Darby.—Mr. President and gentlemen, I have listened with much interest to the paper of Dr. Flagg. My experience with the plastic gold has been limited, yet I have been very much pleased with its working properties. Have found it could be readily adapted to the walls of a cavity, and with as much ease as any of the preparations of gold I have as yet used. Found very little, if any, crumbling, and could work with perfect ease and great rapidity. It makes a very solid filling, and receives

a beautiful finish. Time alone will test its durability, and make known to us its real value as a material for filling teeth. Have abandoned *very* adhesive foil; found, to my sorrow, that there was danger in its use; fillings often present a very uneven appearance after a few weeks, and very much the same as in old amalgam fillings, though not in color. (I speak now of very adhesive foil plugs.) Have used Watt's crystal gold for some time past in finishing; like it much better than foil. Have tried Lamm's shred gold; the first was very poor, but it is very much better of late. Hope the plastic gold may equal its promises and our anticipations, when it will prove a great desideratum to the profession.

Dr. McQuillen was inclined to be cautious in expressing an opinion with regard to the claims of any new material, as he did not wish to make assertions to-day which he might be compelled to recant to-morrow. This was not so much on account of the matter of reputation, or what others would think of him, but how he should regard himself under such circumstances. He felt free to say, however, of the plastic gold under consideration, that during the past month he had used it with a great deal of satisfaction, owing to its easy manipulation, facility of adaptation, unquestionable cohesiveness and beauty of finish. And the best evidence he could give of the estimate which he placed upon the article was manifested by continuing to use it. He was particularly pleased in being able to perform his operations in much less time than usual,—in some instances having obtained satisfactory results in about half the time other preparations had required. Time alone can tell how it will stand the wear and tear of use, and the action of the fluids of the mouth. He had, however, little doubts of the result. The great drawback in the past with regard to all the preparations of gold has been their variability; commanding at one time the highest encomiums, and then bringing with their employment nothing but disappointment and dissatisfaction. Whether this was due to carelessness or the employment of incompetent workmen in their preparation, was difficult to determine. The fact was undeniable, and in expressing this opinion he did not merely give utterance to the results of his own experience, but that of professional friends whose skill is unquestionable, and whose operations are of the most enduring character. If this material should disappoint the expectations excited by the results already obtained, it must give way in its turn to something better. It will have to stand or fall, like everything else, on its merits.

About the middle of the day a box of Lamm's gold had been sent to him for trial, but as yet he had not tested it.*

Dr. Head has used plastic gold for the past six weeks, with more satis-

* Since the meeting of the Society, I have used the gold referred to, and found it equal to the best furnished heretofore by that manufacturer.—J. H. McQ.

faction than he has received from any other form of gold. He considers that by its use time is saved, the material requiring no manipulation before insertion.

In cavities of ordinary size, the packing occupies as much time as to pack foil, the edges requiring even more careful condensation. When filling larger cavities more time is gained, as plastic gold can be introduced and thoroughly condensed in larger pieces than is practicable with foil. He thinks that "plasterers" will not produce better results with this material than with foil.

Has to-day tried a new sample of Lamm's shred gold, and found the quality much improved.

Dr. Stellwagen has had six boxes of Mr. Morgan's plastic gold in use, together with some of Lamm's, Watt's sponge, and Eakin's foil. He had very nearly decided to use the plastic gold altogether, and had done so within the last week with some few exceptional cases where foil or sponge had seemed to yet have the advantage. He said, however, that if *forced* to restrict himself to the use of one kind of gold to the exclusion of all others, he would prefer to use the plastic, as it seemed to be in the state most favorable to the variety and diversity of manipulations required by the dentist. In working this gold he had noticed that oftentimes it could be wedged or condensed laterally like the non-adhesive foil. There was certainly in his hands a great saving of time in the introduction of the gold as well as the preparation, and he felt confident that a saving of from fifty to as low as twenty-five per cent. in time might be claimed. In using the larger pieces he frequently introduced them upon the point of the instrument. There seems to be but very little crumbling or sandiness, but does not appear to be any improvement in the working under water. It may be safely said that as our gold fillings are introduced at the present day, water may be always considered detrimental. The quality of the gold furnished to him seemed to have steadily improved; although he felt satisfied, that the longer it was kept on hand by him, the worse it worked, unless carefully annealed.

Dr. Harris has never used a porous gold; suggested the propriety of reviewing the history of filling materials and the various methods of operating. He referred to the amalgam or succedaneum of the Crawcours. Hill's stopping was then introduced, but never had superseded metallic substances. Annealing foil was a more recent practice. Spoke of the durability of Hudson's work, and thought that the congregation of individuals in large cities, through deterioration of constitutions, rendered the preservation of teeth more difficult. He had never used plastic gold, being out of the profession, but hoped to see some other material than metal introduced for making successful fillings.

Dr. McQuillen regarded thoroughness and speed a very desirable combination in the performance of dental operations, yet deprecated slovenly

rapidity whereby a finely-finished surface would give a meretricious lustre to an exceedingly faulty operation. The proper plan was to learn to do any work as well as possible first, and then as rapidly as consistent with well-doing afterward.

Dr. W. H. Trueman desired to call attention to a point which, he thought, seemed (judging from the remarks made this evening) to have received very little notice or consideration.

How far is a *dentist justified* in using a *secret* preparation? How far is it *professional* for him to use an article when the process of manufacture, and therefore its properties and the effects it may produce, are *unknown* to him? In regard to the article in question, we are informed it is *not* a preparation, but an element, "pure gold;" and that there is nothing used in its manufacture *likely* to act injuriously upon tooth tissue. Without for a single moment intending to cast the least reflection upon the manufacturer's veracity, we must remember he is *not* a dentist; and by so carefully guarding his process of manufacture, he *prevents* the dentist from exercising his educated judgment in the matter, compelling him to wait the slow process of time, either to establish the claims advanced, or teach him by one of the severest lessons of experience, the value of caution. We must not forget that while a dentist is experimenting, *practically* experimenting with a new material, he is risking not only his time and money, but what is of far more value, especially to a young man, his reputation. We can reasonably ask for more light upon the process of manufacture before using *this* article, from the fact that it is something new, and has not the appearance pure gold usually presents, unless it has undergone a process requiring *the strongest acids.* If the process by which this is obtained *is* entirely new, then it should be the more carefully studied, lest some undesirable *new feature* has also been developed by which an inert substance may have acquired injurious properties. These things can only be studied by the dentist himself, first in theory, and then in practice. With the manufacture of foil, we all are or may be perfectly familiar. True, there are some little "*kinks*" peculiar to the various makers, affecting the working properties of the foil, which they very carefully guard as "trade secrets." Carefully prepared foil is free from the *presence of acid* (so much and so justly dreaded in any material for filling teeth). We *know* it does not exist; the ordeal of the crucible is sufficient to cleanse it from the least and last remains of this enemy, while the presence of other impurities, as a general thing, will so far deteriorate its working properties as to render it an extremely difficult task to put in a *good* filling with *poor* material.

I make it a rule not to use in the mouths of my patients any *secret* preparation whatever, no matter how well they may be recommended.

I have a very *decided* objection to working in the *dark.*

I do not think a dentist has any more right to use a secret preparation

than a physician has to prescribe a remedy, the ingredients, properties, and possible effects of which are unknown to him.

Dr. Ellis thought we were almost as ignorant of the manipulation employed in the manufacture of foil. Had been informed by good authority, that impurities in foil had frequently occasioned its condemnation, although, to the vision alone, it presents nothing objectionable. He had heard others complain, and could himself testify to the unsatisfactory nature of the replies which were given by foil manufacturers to inquiries addressed by practitioners, touching the modus operandi of its manufacture. He had used Morgan's gold with great satisfaction for several months, and regarded it a very valuable material.

Dr. Harris hoped he would not be misunderstood, and that his remarks would not deter any one from giving the plastic gold a thorough trial, and he was and always had been in favor of the fair trial of every innovation tending to the advancement of the profession and the extension of its usefulness.

Dr. McQuillen directed attention to a microscope on the table which had been prepared for the use of dentists, and exhibited some sections of teeth and bones under it. The instrument was one which would be found of service in ordinary observation, and to those just entering upon the study of microscopical structures. The moderate price asked for it brought it within reach of many who might feel that they could not afford to purchase a more powerful and necessarily expensive one. He hoped it would be the means of increasing the number of observers, as real workers are very scarce.

A new syringe, with a gum-elastic bulb, was also exhibited. By compression of the bulb, the air was forced out of the instrument, and the nozzle being placed in the water, the latter rushed in and was then forced out in a steady and strong stream by again compressing the bulb. He had employed the instrument for some time, and preferred it to the old-fashioned silver syringe.

Upon motion of Dr. Henry, the Society then adjourned until the first Monday in September (Sept. 2d, 1867).

REPORT OF THE CONNECTICUT STATE DENTAL ASSOCIATION.

BY J. H. SMITH, NEW HAVEN, CT.

THIS Association commenced its third annual session at Hartford on Tuesday morning, May 21st, 1867.

The meeting was called to order by the Vice-President, Dr. W. W. Sheffield, of New London.

Dr. McManus, of Hartford, offered the following resolution:

Resolved, That this Society approves of the establishment of a New

England dental journal, to be conducted by a board of editors; and that each of the New England societies be invited to unite with us in such a publication by appointing one of its members to the board of editors.

After a lively discussion by the members generally, the resolution was unanimously adopted.

On motion, Dr. A. Hill, of Norwalk, was appointed editor for the Connecticut State Dental Association.

Dr. Hill read a letter from M. E. White, M.D., of New Haven, in regard to the establishment of a dental college in connection with Yale Medical College, and moved that a committee be appointed to confer with the medical profession who are to meet in this city on the morrow. This was agreed to, and Drs. Hill, S. Mullette, J. M. Riggs, and W. W. Sheffield appointed as the committee.

First Day—*Afternoon Session.*

The Association elected the following officers for the ensuing year:

President—Dr. J. M. Riggs, Hartford.

Vice-President—Dr. Sam'l Mullette, New Haven.

Recording Secretary—Dr. J. H. Smith, New Haven.

Corresponding Secretary—Dr. S. L. Gier, Norwich.

Treasurer—Dr. E. E. Crofoot, Hartford.

Librarian—Dr. J. McManus, Hartford.

Executive Committee—Dr. J. H. Smith, New Haven; Dr. C. L. Smith, New Haven; Dr. H. L. Sage, Bridgeport.

The following persons were admitted as members of the Association:

Drs. T. S. Rust, Meriden; A. Newton, Hartford; B. Arnold, East Haddam; B. E. Snow, Bridgeport; H. Forbush, Norwich; D. N. Davis, Middletown.

Honorary Member—Dr. G. W. Miles, Vermont.

The President then announced the subject for discussion, "Sympathetic Diseases of the Teeth."

Dr. McManus, of Hartford, read a very able paper upon the subject, eliciting a lively discussion by Prof. Atkinson, of New York, Drs. Hill, Hurd, and others.

First Day—*Evening Session.*

Bridgeport was designated as the place of meeting for the next semi-annual meeting.

The subject under discussion in the afternoon was resumed, and continued until the adjournment at 9 o'clock.

After the adjournment the members, together with other invited guests, partook of a most sumptuous entertainment provided by the Hartford Society of Dentists. Dr. E. E. Crofoot presided, and welcomed the company in the name of the Society. Supper being over, President J. M. Riggs made a brief address, and closed by proposing the following sen-

timent: "Our invited guests, especially of the Border States of New York and Massachusetts." This sentiment was finely responded to by Drs. Shepard and Searles, of Massachusetts, Drs. Hurd, Atkinson, and Francis, of New York.

Second Day—*Morning Session.*

"Sensitive Dentine" was announced as the subject of discussion. Drs. Woolworth, Welton, Hurd, Stevens, and others took part.

Dr. Woolworth stated that he used arsenic to destroy sensitive dentine, and *never* had a case where the pulp died.

Dr. Stevens said, he was fully convinced that evil effects followed the use of arsenic, and it was a mystery to him how Dr. Woolworth could use it successfully.

Dr. Hurd stated a case of severe damage having been done by the use of arsenic in destroying sensitive dentine.

Dr. McManus used creasote with prepared chalk; filling the cavity and leaving it for several days. This method was highly commended by the members present.

Dr. Woolworth said, perhaps it was the creasote which he used with the arsenic that did the work; the latter being washed out by the fluids of the mouth.

The following delegates were appointed to attend the American Dental Association, to be held at Cincinnati, the last Tuesday in July next:

Drs. S. Mullette, E. S. Gaylord, J. D. Riggs, H. L. Sage, R. E. Snow, C. L. Clemons, T. S. Rust, N. B. Welton, F. C. Buckland, R. C. Dunham, W. W. Sheffield, G. W. Boutwell, and A. Hill.

The delegates to the Medical Convention reported that their statements in regard to establishing Dental Professorships in Yale College were listened to with attention, and a promise given to appoint a committee from their number to confer with a committee of dentists upon the subject.

The same gentlemen were accordingly reappointed as said committee, with the addition of Dr. J. T. Metcalf, of New Haven.

Dr. Woolworth read an essay upon the general subject of dentistry, after which the Association adjourned to 2 o'clock P.M.

Second Day—*Afternoon Session.*

Dr. R. W. Browne offered the following resolutions:

Resolved, That this Association is opposed to the use of anæsthetics as frequently exhibited in dental practice, but where circumstances justify their employment would consider nitrous oxide gas, properly made and judiciously administered, as the safest and best.

Resolved, That, while appreciating the value of anæsthetics in our practice, we deprecate the sacrifice of any natural teeth whatever to satisfy either the cupidity of the practitioner or the pride of the patient.

Resolved, That a reckless disregard of truth in securing patronage, whether by advertisements, or the paid services of newspaper writers, is inconsistent with the honor and dignity of the dental profession, and should receive the execration of every honest member of it.

These resolutions, together with the general subject of the use of anæsthetics in dentistry, were discussed by Drs. Hill, Atkinson, Brown, A. B. Smith, Stevens, Riggs, Sheffield, and others. During the discussion some of the members gave their experience in the use of ether spray; after which the resolutions were adopted, and the Association adjourned to meet at Bridgeport the first Tuesday in October next, at 11 o'clock A.M.

THE HARRIS DENTAL ASSOCIATION OF LANCASTER, PA.

BY M. H. WEBB, D.D.S., LANCASTER, PA.

A PRELIMINARY meeting of the dentists was held in Lancaster, Pa., May 30th, 1867, with a view to the organization of an association for the promotion of professional and social intercourse among the members of the dental profession. Dr. Saml. Welshams was called to the chair, and Dr. M. H. Webb appointed secretary. A committee, consisting of Drs. McCalla, Derr, and Miller, was appointed to prepare a draft of a Constitution and By-Laws, to be submitted to a meeting to be called by the committee.

An adjourned meeting was held June 21st, 1867, to hear, and act upon the report of the committee appointed at the former meeting.

On motion of Dr. J. S. Smith, the report was received, and the committee discharged.

Dr. P. W. Hiestand moved to take up the Constitution and By-Laws for action, when, with some slight amendments, they were adopted *seriatim.*

A committee to nominate officers for the permanent organization reported the following names, which were balloted for and elected to serve one year:

President—Dr. Jno. McCalla.

Vice-President—Dr. J. W. Derr.

Secretary—Dr. Wm. N. Amer.

Treasurer—Dr. E. K. Young.

Executive Committee—Drs. Saml. Welshams, P. W. Hiestand, M. H. Webb.

The President, upon taking the chair, delivered the following address:

Gentlemen of the "Harris" Dental Association of Lancaster, Pennsylvania,—We are assembled here to-night under circumstances of peculiar interest. We have just inaugurated the first association of dentists ever convened in Lancaster. Many of us have long felt the necessity of and hoped for such an organization, but the conflicting elements prevailing among our craft have hitherto kept us from engaging in any united effort to advance its interests.

Where the membership of an association is so little centralized, as ours has been in this community, a warfare of clashing interests and aims is constantly kept up at the expense of the general good, and honorable advancement of all; the duties of our professional relations to the community and the world of science require the virtual, if not the formal organization of our fraternity. "A house divided against itself cannot stand."

Happily the AMERICAN DENTAL ASSOCIATION, and the various local organizations springing up in almost every county of our widely extended domain, promise to put this movement to the proof, and give all the benefits which must eventually follow.

Our highest interest consists in the removal of all jealousies and exclusiveness, and in a self-reliant courage to go forward in every movement which recognizes the moral, intellectual, and social advancement of our specialty as of paramount importance.

The system of voluntary association is beyond doubt the best means to accomplish this end; under liberal, yet cautious and guarded provisions, we gather together those that are capable of the reciprocities of an honorable brotherhood. The presence of so many here this evening, and the harmony and kind feelings exhibited in your deliberations, augur a better state of affairs in the future. Let us not become weary in well-doing; united and persevering effort put forth in a good cause is sure to be attended with success.

We are engaged in a calling which not only requires the hands to be carefully exercised in the most delicate operations, but judgment and skill must be brought into active exercise, for the purpose of conceiving and carrying out the best means of counteracting, or arresting the inroads of dental malformation or disease. There is nothing so important to the successful practice of our profession as close and careful observation of facts and results. It is not only necessary that we should observe and reflect upon the instructive facts which present themselves to our daily observation, but try to cultivate whatever abilities we may have for recording them, and thus be enabled to contribute something to the general fund of information.

While it is well to freely associate with all honorable members of our profession, we should not recognize those who are dishonest, or who remain willfully ignorant; let the public see that we are in no way responsible for their injurious practices; let us state our opinions frankly of their malpractice whenever good is to be accomplished by it, and while we freely condemn all that is wrong, let us be careful to give credit wherever it is due. Rest assured that by such a course we will eventually gain the confidence of those whose good opinion is most desirable, and be saved from the annoyance of those who are unreasonable. And now, gentlemen, let me say, that a punctual attendance at our meetings, as far as practi-

cable, is earnestly solicited. Let each member come prepared to contribute something to the stock of knowledge. In this way alone a constant and increasing interest will be kept up, and the objects of the Association fully realized.

On motion, adjourned to meet in August at the call of the officers and executive committee.

TRANSACTIONS OF THE BROOKLYN DENTAL ASSOCIATION.

BY. W. C. HORNE.

May 29, 1867.

THE Association met at Dr. John Allen's.

Dr. Atkinson made a report of the action of the Connecticut State Dental Society, at its late meeting in Hartford, in reference to the establishment of a dental college in connection with one of the New England colleges; and also of the purpose to establish a dental magazine as the organ of all the New England dental societies. He expressed his gratification at the progressive spirit manifested by the Eastern dentists, and commended their example as worthy of imitation in other quarters.

Dr. C. P. Fitch asked the attention of the Association to a preparation of gold for filling teeth, which had been brought for presentation to the Society by Dr. G. W. Ellis, of Philadelphia.

Upon invitation, Dr. Ellis presented a specimen of his gold, some of which was placed under the microscope for inspection. It was denominated "Plastic Gold." He said that a conviction of its merits, induced through several months of uninterrupted use, prompted him to bespeak for it an early trial; believing that a careful test could but develop its virtues, while a postponement of its employment withheld from the dentist a source of great comfort in the performance of his operative duties. In substantiation of the manifold claims made for this gold, he presented the names of a few of the best operators in Philadelphia; remarking, that by these and many others it stood not only approved but preferred above all other filling materials. Indeed, several old dentists enjoying high reputation for their skill in filling teeth, who had heretofore persistently rejected everything but foil, had, after some weeks' trial of the plastic gold, become so impressed with its value as to abandon entirely the stand-by of years. The features rendering it especially desirable are the following: absolute purity, ease of manipulation, perfect adaptability, rapidity of introduction, freedom from waste, cohesiveness, solidity, beauty of finish, and adhesion when wet. In mentioning the last property, he would not be understood as advocating wet fillings; on the contrary, he believed it under all circumstances advantageous to entirely exclude moisture; yet in those cases which baffle our best efforts to prevent its ingress, satisfaction is experienced in the consciousness that its presence will not seriously embarrass the operation.

Dr. Ellis also exhibited instruments adapted to the manipulation of the plastic gold; the points having shallow and well-defined serrations.

A committee was appointed, to whom the subject was referred, with the request that each member should present his opinion. The committee consists of Drs. Fitch, Marvin, Francis, Varney, and Bogue.

Dr. J. S. Latimer presented interesting remarks on the use of the microscope.

Adjourned to the usual time.

EDITORIAL.

PUBLISHER'S NOTICE.

This number commences the ninth volume of the Dental Cosmos. Its publication was begun in August, 1859, and the subsequent volumes have dated from that month. This fact has been the cause of misapprehension and annoyance to subscribers, many of whom desired their subscriptions to commence with January, which, if allowed, gave them and left us incomplete volumes; and, if not allowed, was apt to cause misunderstanding. In view of these facts, it has been determined to publish one volume of five numbers, beginning with the present number (August) and closing with December, 1867, in order that subsequent volumes may date from January of each year.

The price of this volume, which will be complete in itself, with index as usual in the last number, will be $1.00. The 1st of January, 1868, will be the commencement of the tenth volume.

Those who desire to renew their subscriptions are requested to do so at as early a date as possible, that we may determine the number of copies to be published.

S. S. White.

AN IMPOSTOR.

Dr. W. H. Robinson writes us from Leavenworth, Kansas, giving information of the operations of an impostor, a man representing himself to be a wounded soldier destitute of means, formerly a dentist, and at one time in the employ of S. S. White, at Philadelphia. He has been going about various parts of this country and the Canadas since 1864, soliciting of the dental profession money to assist him to get to his relatives, whom he sometimes represents to reside in Iowa, and at other times in California. The doctor says he is "a man of average size, about thirty years of age, calls himself H. B. Ayer, and is a first-class impostor," who has led a dissolute life for several years past on the charity of the dental profession.

PERISCOPE OF MEDICAL AND GENERAL SCIENCE IN THEIR RELATIONS TO DENTISTRY.

BY GEO. J. ZIEGLER, M.D.

"*Influence of Extreme Cold on Nervous Function.* By BENJAMIN W. RICHARDSON, M.A., M.D., F.R.C.P., Senior Physician to the Royal Infirmary for Diseases of the Chest.—The lecture I am about to deliver to-day is intended as a mere pioneering attempt towards the simple solution of one of the paths of Medical learning at present very obscure. The foundation of the lecture is experiment—experiment showing the effects produced by the exposure of parts of the nervous system to extreme cold. The inquiry, in the minuteness of detail in which I shall be able to place it before you, is new in Medical science. Heretofore, the phenomena produced on animal bodies by extreme cold were general in character. Now, by the process of freezing by means of volatile fluid in the form of spray, we can isolate phenomena. We can go to any part of the nervous tract, and without even subjecting the animal body to pain, can descend upon that nervous tract and cut off all function as perfectly as if we removed the part operated upon. For minutes—and, indeed, I had almost said for hours—we can sustain this temporary death and observe all the attendant phenomena; then we can let the function be restored, quickly or slowly, as we may list, and, through every stage of observation, observe what takes place.

"I feel unusually fortunate in this inquiry that I do not stand alone, nor trusting purely to my own individual observation. While I have been working in England, one of the most distinguished of our brethren, Dr. S. Weir Mitchell, of Philadelphia, has been independently working on the other side of the Atlantic. Without concert—without either of us knowing that we were investigating the same truths—we have thus been laboring in the same direction; we have had similar objects before us; we have used similar instruments and means of research; and as we have both looked upon what has been presented to us without any bias, recording only what we have seen, we have on some points arrived at facts and conclusions which may be considered identical. Had we been two astronomers separated widely from each other, and observing, in our respective observatories, some one phenomenon of the heavenly bodies, we could not have observed more uniformly. I shall, therefore, venture not unfrequently, as I speak, to combine Dr. Mitchell's observations with my own; or, rather, with our own, because you will see with me on this occasion, and we will have before us little that is not directly demonstrable. We shall study our subject best, I think, by following it up thus:

"The influence of extreme cold—

"1. On periphery of nerve.

"2. On nerve-fibre.

"3. On the cerebrum.

"4. On the cerebellum.

"5. On the medulla.

"6. On the spinal cord.

"INFLUENCE OF EXTREME COLD ON PERIPHERY OF NERVE.

"When a part of the living body in which nerves are ultimately distributed is subjected to cold up to the point of freezing of the tissue, the disturbance of functions varies according to the progress of the reduction of the temperature and the progress of recovery. As a rule, to which there are few exceptions, and those exceptions also limited in range, the degree of cold must be brought to 16° below freezing-point on Fahrenheit's scale before actual freezing takes place. By care in the process the reduction of temperature may be brought much lower, viz., to 10°, and even to 8°, without freezing, but in the act of freezing there is an instant rise in the thermometer to 16°. In this respect the phenomena are similar in character to those which occur in freezing water simply, for water can be brought 8° or 10°—nay, 15°—below freezing-point, and may yet be fluid, but when it solidifies it rises to the fixed degree, 32°. I am speaking in the above of the freezing of the human living body. In other animals there are differences of degree on which I do not at this moment venture to dwell. The phenomena objective and subjective which are presented during the application and after the application of extreme cold are well marked, and, if time be given for their steady development, are uniform.

"As a first experiment, Dr. Sedgwick will demonstrate these phenomena slowly on a portion of my arm. For this purpose he will take ether of different boiling-points; one ether with a high boiling-point, and therefore slow power; and then one with a low boiling-point, and consequent quick action; thus we shall have all the shades of modified function slowly brought before us.

"As the experiment progresses, the first subjective sign is a sensation of coldness, while of objective signs there are none. The sense of coldness is due to the superficial abstraction of heat from the nervous network. In a little time there is an objective phenomenon, the part becomes vascular, and there is a new subjective phenomenon, the part feels hot. These phenomena are due to several causes; the blood traversing the part is less plastic; the tension derived from the nerves and exerted on the vessels is reduced; in the part there is increased vascularity, and around the part there is resistance, which gives pain. We change the ether and rapidly freeze. There are now two objective signs, as you will see—sudden blanching of tissue, and surrounding redness. There are also two subjective signs—in the blanched frozen part there is an utter absence of sensibility; in the vascular part around there is slight burning sensation and exalted sensibility. In the blanched part the nervous filaments are compressed by the solidification, and the vessels also compressed are without blood. In the reddened part the nerves and vessels are not yet subjected to compression, but the vessels are surcharged with blood, and the sensation is that of a burn or of acute inflammation. We now remove the ether and let the frozen part return to its natural state, and the result is a gradational change towards the natural condition by a series of steps as certain as those we have already studied. The white part becomes very vascular, it gives the sensation of heat, and it slowly returns to the natural functional state in which primarily we found it.

"Let these phenomena, so simple, but so exact and decisive, remain, if you please, firmly fixed on your minds; they are typical phenomena, and are never disarranged when time is given for their development. These effects resulting from the action of extreme cold occur in common in the

human subject and in many of the warm blooded animals, but they are not manifested in the same distinct manner in every animal, because the time required for the development of the changes varies. In pigeons, from the greater natural heat of their bodies—viz., from eight to ten degrees above human blood heat—each step of the process is prolonged, while the returning action is specially rapid. In cold-blooded animals, on the other hand, every step towards freezing is so quick that the final stage may be reached before any preliminary stage can be detected. We will put this latter fact to the test. Here is a large active frog. Dr. Sedgwick will hold for me the foot, and I will direct upon the part the ether. Observe that hardly a second elapses before there is whiteness, and now the whole foot is a frozen, hard, and even brittle surface. The stage of excessive action was here passed over, or at all events, if it did occur, we could not perceive it. So low, indeed, is the force of the frog that one or two blasts of the spray of this active compound ether directed on the body would destroy life altogether. The variations of phenomena of which I speak are due entirely to variations of natural heat in the body operated upon. Hence, again, they may be presented in some measure in the human subject, according to age and condition of health, and even according to the local condition of a part. In men in their prime, men whose nervous systems are well charged, the preliminary stage of vascularity, which I would call the stage of *preaction*, is prolonged; the part is hard to kill, while reaction is sharp, quick, and decisive. In the first stages of acute local inflammation, as in cases of whitlow, such is the manifestation of calorific force in the part that it becomes actually a difficult task to get beyond the stage of excitement or overaction, and the tendency to reaction is such that when the part has at last become frozen it can only be held in that state by the most vigorous efforts directed to keep down reaction.

"On the other hand, in debilitated persons, in weak children, in those who are enfeebled by disease, and especially in aged people who have lost nervous power, and are in, or are nearly approaching, second childishness, the action of cold on the peripheral surface is so rapidly developed that freezing of structure is almost instantaneous. I have seen a man, in fact, whose resistance was not greater than the resistance of that frog upon which we have just experimented. In this case I was applying the ether spray to the gum for the extraction of a tooth. Within two seconds the gum was frozen at the point upon which the spray was directed, and the whitening so rapidly extended along the gum that I was actually startled by the extreme suddenness of the phenomena. In this gentleman every part of the body seemed to be equally susceptible to the cold. In an important degree, indeed, the resistance of the body to the local influence of intense cold is a measure of the physical power of the organism, an excellent means of diagnosis, and a test of the value of life. I do not mean that a man who resists local cold beyond what is common is necessarily the healthiest man, because resistance may signify preternatural heat, frictionally developed in excess in some part of the machine. I mean only that a fair amount of peripheral resistance indicates a soundness of organism as compared with that feeble resistance which is typified in the aged. In respect to the local influence of cold on the periphery of nerve, I should add that in the same body the difference of resistance is well marked out in different parts. Thus there is always more resistance in parts which are naturally subjected to motion. There is more

resistance in the hand than in the arm, and in the limbs than in the central portions of the back.

"Before leaving this subject, let me refer once more to one of the phenomena to which I asked attention when my arm was under experiment. You saw that at the moment when the skin underwent blanching there was a peculiar and sudden increase of redness around the blanched part; there was a surrounding vascular line. In this line there was increased heat and exalted sensibility. The sensation in the line was that of burning, and, indeed, the sensation was the same as that produced by a heated substance. The surface of body in this case was in the same state as was the frozen surface previously to the moment of freezing, the stage of preaction; and it was in the same state as the frozen skin became during the stage of reaction. What is the cause of this phenomenon? The cause is simple. The blood, in the part subjected to cold, having been kept in a state of entire fluidity by the cold up to the point of freezing, was forced by the mechanical contraction of the unnerved vessels into the surrounding vessels, themselves weakened by the proximity of the cold. Thus the surrounding vessels became intensely congested; there was resistance in them, there was friction, and, as a result, there was actually an increased development of heat in them.

"To place the effect of cold on the peripheral surface of nerve in a concise form, we may classify the changes which are developed by cold and during recovery in the following order:

"1*st Stage, or Starting-point.*
Natural condition:
Temperature 96° Fahr.
Sensibility perfect.

"2*d Stage* (*Preaction*).
Innervation; removal of nerve-force.
Increased vascularity.
Increased temperature.
Exalted sensibility.

"3*d Stage.*
Inertia.
No vascularity; no nerve-force; no blood.
Temperature 16° Fahr.
Perfect insensibility.
Solidification of water of tissues.

"4*th Stage* (*Reaction*).
Returning vascularity of paralyzed vessels.
Increased vascularity.
Increased temperature.
Exalted sensibility.
Re-solution of water of tissues.
Innervation continued.

"5*th Stage.*
Return to natural state.
Nervation of vessel.
Reduction of vascularity.
Temperature 96°.
Natural sensibility.

"Influence of Extreme Cold on a Nerve-cord.

"When a compound nerve-cord supplying voluntary muscle is subjected to cold in the same gradational manner I have described in the preceding experiment, there is first subjectively evoked, as I find by acting upon the ulnar nerve, some overaction, causing sensation towards the distal extremity of the limb. At the same time the will controls the muscular motion, and there is no trace of convulsion. As the nerve-tissue becomes actually frozen, sensation is entirely destroyed at the part acted upon, and, as we learn, by operation—especially by the operation of nerving in the horse—the frozen nerve-cord may be cut through without any pain whatever being elicited; this is true, also, of the human subject, as I have witnessed during operations where the frozen trunk has been divided. The objective signs presented by the experiment are striking. At first the nerve is seen slightly colored, then it suddenly becomes intensely white, very hard, and, I had almost said, of dull metallic lustre. This occurs whether the nerve be living or be just dead. I can, therefore, show you frozen nerve-cord by experiment. We have here a portion of nerve-cord, which we place in this glass tube. We direct our spray on this tube until the nerve within is frozen. Now I pass the frozen nerve round, in order that those of you who get it before it is thawed may compare it with the other unfrozen portion of nerve that accompanies it. In time the nerve relaxes as the cold is withdrawn, and assumes, with little so-called reaction, its natural character.

"And here let me demonstrate a new and curious fact in reference to the power of the nerve trunk to convey an electrical current. To carry us on from step to step, we will start with a portion of perfectly desiccated nerve. The nerve has been dried at a temperature below 100°, and wants only so much water to make it active nerve again. We try to make, then, this dried nerve form a portion of a circuit of a weak continuous galvanic current derived from one of Mr. Pulvermacher's beautifully constructed chains. We test for the current with this large but delicate galvanometer, fitted up for the present occasion by Mr. Pulvermacher, and the result is that we find no indication of any transmission of current. We turn to a small and much more delicate galvanometer, and still there is no current. The desiccated nerve does not connect, and the current is arrested in its course. We take now a portion of fresh nerve, and place it in a glass tube. We try to make this piece of nerve form part of the circuit of a feeble galvanic current, and we test for the current. You will see at once the rapid deflection of the needle of the large galvanometer; the needle moves twenty-six degrees on the dial. This nerve matter, consisting of water, fat, and albumen, conducts; it does not conduct like metal wire, but it conducts well.

"We will make a third change; we will take a portion of fresh nerve fibre, placed in a glass tube, as in last experiment, and freeze it as fully as we should need to freeze it if we wanted in the living body to cut off sensation by the process. We now test again for the electrical current, making the nerve act as a part of the circuit; and although this time I should fail to show a current with the large galvanometer, I shall find it here in this small and very delicate instrument. Observe how true this is: the needle moves twenty-five degrees, showing positively the passage of a current. In this experiment we have an analogous phenomenon to that which occurs when, pressure of a mechanical kind having been ap-

plied to a nerve, an electrical current is transmitted through the compressed part. By pressure we can cut off all sensation, but yet, when we test the conducting power, we can find there is still a passage of the galvanic current.

"We must not, however, spring at the conclusion that we cannot by any degree of cold stop the transmission of the electric current through the nerve. We can do this by continuing the freezing process until every portion of the nerve is rendered equally inert, and all the water of the nerve-tissue is converted into ice. Then nerve matter becomes composed of two separated constituents, both imperfect conductors, so-called non-conductors—viz., of water now in the form of ice and of solid nerve matter. In this state the nerve is virtually disorganized—that is to say, its natural parts are disarranged and altered in physical quality, and then there is no conduction of electricity. In this case again, pressure may afford us an analogous condition—that is to say, if we carry pressure on nerve to the extent of breaking up the nerve-tissue and dividing it, we destroy the power of transmission. At the same time there is a marked difference of result; the frozen nerve by care in its treatment will recover at once, but the nerve injured by pressure is usually injured beyond all recovery.

"Experiments on the influence of galvanic action on frozen nerve may be made with effect and with wonderful precision, because without pain, in a living animal rendered for the time dead generally to excitement and suffering. If in this condition the sciatic nerve of a large rabbit be laid bare, and, without dividing it, a feeble galvanic current be passed through a portion of the nerve (say half an inch) well insulated, the galvanometer will demonstrate the free passage of the current, and, coincidentally with the deflection of the needle, there will be a convulsive twitch in the muscles of the limb supplied by the nerve. If we now freeze the nerve in the part included by the needles, we can watch all the gradations from the natural state up to the state of absolute freezing of every part of the nerve-cord. At first the needle will be deflected, say forty degrees, and the muscles, with each make or break of contact of the battery, will twitch vigorously. As the chilling progresses, the action of the needle will continue until the moment of actually freezing; and even now, although sensation would be cut off, there will be some indication of current by the needle, and also indication of movement in the muscles. At last, the extremest degree of freezing having been carried to every portion of the nerve fibre, the needle stands motionless, and the muscles, the same as the needle, forbear to give any sign of action.

"In this inactive state we can hold the parts for long periods of time if we please, and then, by withdrawing the cold and allowing a slow reaction, we can restore them to their natural functions.

"One other point is worthy of notice, and it is this :—that if the nerve be fully frozen, not between the two poles including the nerve, but above them—that is to say, on the brain side—the muscular motion previously produced by making and breaking contact is as completely checked as when the frozen part itself forms the portion of the circuit, the motion being equally restored as the part is allowed to recover its usual temperature.

"Thus we learn that the function of a compound nerve can be destroyed as effectually by extreme of cold as it can be by excessive pressure, or even by actual division. But there is this grand difference : in the first

case the structure of the nerve is dangerously injured, if it be not actually destroyed; while in the latter case there is no positive injury, but merely and solely a temporary, but for the time total, extinction of function. These effects of cold on the animal body seem to me to be developed in every part, in every structure. By removing force we destroy action, or, in other words, those phenomena which exhibit matter under the influence of force; but we in no way injure matter so as to disenable it from further work. Resupply it with the force taken from it, and it is as ready again for function as if nothing had happened.

"If we pass from nerves of a compound character to nerves supplying semi-voluntary muscles or voluntary muscles, the objective changes in the nerve itself are the same as before stated in relation to compound nerves. But there are other phenomena of a remote kind developed in the muscular parts supplied by the nerve. Thus, if we lay bare the phrenic nerve and apply the spray to it at one section, there is at first violent excitation of the diaphragm—action that is so violent it can be heard, I may say, as well as seen. In time this action becomes subdued, and as the nerve is frozen through its entire structure, there is sudden cessation of movement of the diaphragm, and rigidity of the muscle, which lasts until the nerve is thawed, when the natural action is restored.

"On the Influence of Extreme Cold on the Cerebrum.

"The facts relating to the influence of extreme cold on the living cerebrum are so striking that unless they are actually witnessed they are scarcely to be realized by the mind. At the same time they are so simple they can be demonstrated by any careful experimentalist.

"And first I would observe that the cerebral structure while yet alive undergoes, on exposure to cold below freezing point, the same changes as other living structures under the same influence. The structure can be frozen as hard as bone, but the time required for freezing it is longer than is required for skin, and the depth of surface frozen is slighter. When quite frozen, brain-surface has a white, almost metallic appearance.

"In some cold-blooded animals, as in frogs, the process of freezing the cerebral organs with active ether is a matter only of a few seconds, and is much better as an experiment than the ablation that up to the present time has been practiced. At first the process of cutting off the cerebral action by the cold destroys conscious effort on the part of the animal, but in a little while, even if the frozen state be well sustained, there are apparent evidences of conscious acts, of what may be called in these animals spinal consciousness. There is apparently conscious movement, and there is natural breathing and pulsation; but there is this one peculiarity—that, although the limbs move when touched or irritated, the movement is clearly not from pain; it does not follow the application of the irritant immediately, but after some hesitation; it is what is sometimes called a reflex movement, but what ought to be called an *indirect* movement. By increasing the irritation, this indirect spinal movement can be made convulsive in character, and even tetanic. This is due clearly to the condition of the spinal cord, which is receiving, or rather sustaining, the force that ought to be distributed equally through it and through the cerebral ganglia; for if in this condition we play a jet of ether on the spine, we excite convulsion, stage of preaction; but if we go on so as to attract more force, we produce paralysis of an universal kind, and even death. Presuming we do not interfere with the cord, and, having frozen the cere-

bral organ, allow it gradually to come back to its usual state, there is always perfect recovery on the part of the animal. These observations on frogs are fully confirmed by the experiments of Mitchell, as far as his experiments with the same creatures extend. He says, speaking of frogs, 'When the rhigolene jet' (Mitchell in his inquiries uses often a petroleum called rhigolene in place of ether) 'is thrown upon the region of the brain, the functions of this organ are abolished for a time, and the frog exhibits the phenomena which are common to this animal when it is decapitated. A jet cast on the spine occasions spasmodic movements of the legs, and at intervals violent tetanic contractions. After a few minutes the frog is able to crawl, but it does not recover the power to leap, its usual mode of locomotion, until a longer time has elapsed. Recovery is always perfect, and there are no backward movements.'

"I have one remark more to make on the subject of freezing the cerebrum in frogs. When the cerebrum alone is frozen, the act is so sudden that the animal becomes insensible at once, without any sign of that pre-excitement which I have called the stage of preaction. But after the brain has been rendered inactive, and when by that means the spinal cord has become surcharged with force, then, by directing the ether on the overexcitable cord, a stage of preaction, even in this, a cold-blooded animal, is definitely produced.

"The influence of extreme cold on the living cerebrum of a warm-blooded animal is still more remarkable. In young animals, where the bones of the head are thin and almost membranous, the cold can be applied to the extent of freezing the cerebral substance without any preparation of the animal. In extremely cold weather, as during the late winter, the freezing process can be sustained for many hours without any risk to life; in warm weather there is a difficulty in restraining the reaction, and there is therefore danger.

"The phenomena presented on freezing the living brain of a warm blood are as follows: There is first produced a soothing effect, followed in a short time by a stage of excitement, in which stage or degree common sensibility is to a very large extent lost. The muscular power of the animal is unbalanced. This stage is identical with the degree of narcotism from a general anæsthetic called by Dr. Snow the second degree. The cold being continued, the animal gradually lapses into profound stupor and complete general anæsthesia, in which state it may be kept for a long time by sustaining the cold. Young animals can thus be made artificially to hybernate, and in this state any surgical operation can be performed without pain.

"The time and form of the recovery turns entirely on the mode in which the process of recovery is allowed to take place. If the animal be placed in a temperature not above 45 Fahr., and not below 35 Fahr., it will gradually recover without showing any excitement whatever. It will slowly awake, as from a long, and deep, and pleasant sleep. In other words, by virtue of the slow restoration of function incident upon the slow thawing of the brain structure, the stage of reaction will not be visibly manifested.

"If, on the other hand, the animal be placed, while the insensibility is complete, in a higher temperature, say even in a temperature of 60 Fahr., then it will not recover so easily; then from the deep sleep there will be a passage into restlessness, and from restlessness, it may be, into convulsion. If the symptoms be not severe, there will be reeling and rolling of

the body, as in drunkenness, imperfect action of the limbs, and slower recovery.

"With due care in the experiment, it does no harm to sustain freezing of the cerebrum for a long time. During the intensely cold weather of the late winter I put a pigeon to sleep by freezing the brain, and laying it, quite insensible to all the outer world, on the table of the laboratory, the air of the laboratory being at 32°. I kept up the effect, by an occasional breath of ether, for seven hours—viz., from 10 o'clock in the morning until 5 in the afternoon. Then the animal was put in a comfortable hutch, with another bird of its own kind. At 7 o'clock it was asleep, but could be roused, and on the following morning it was as well and as lively as its fellow; indeed, it could not have been surmised by any one who knew nothing of the facts that the animal had been in any way disturbed or removed from its usual state of existence. Wound up with the force latent in food, it took on action once more as well as ever.

"Again, if care be taken in the process of recovery, so that the reaction is not violent, the number of times that the cerebrum is frozen does not make any important difference—granting, of course, that between each freezing sufficient time be allowed for recovery, and that plenty of new force be given by food to restore motion. Thus I have known the cerebrum frozen so as to produce entire unconsciousness forty-six times in the same animal, and certainly with no more hurt than if the animal had been narcotized with chloroform as many times.

"In these experiments, sometimes, an accident will happen, and the animal will die. When this occurs the freezing process has suddenly extended too low—viz., to the medulla oblongata—and the respiration has been stopped, of which more will be said in due time.

"And now for experiment direct. We have here a pigeon which has been put to sleep several times by having the cerebrum frozen. The day is so intensely hot I prepare you for some little loss of time in repeating the experiment; but we will proceed. I will direct, with a fine jet, a spray of compound ether on the anterior part of the cerebrum; the thin bony walls of the skull intervene, but these will only cause some delay. At first no peculiar action is manifested, but soon there is excitement, and this state of excitement will last for two or three minutes. At last, observe, the bird settles down into sleep; it is quiet and powerless, insensible to pain, and dead to all impressions: we could at this time operate upon it without causing the merest evidence of sensibility; but as the process has only been just carried far enough to show you the production of insensibility, the recovery will be rapid and complete, without any violent reaction.

"In birds the stage of pre-excitement is marked by attempts to fly, sometimes forward, sometimes backward; the period of reaction is marked by similar phenomena. In other animals the excitement is muscular mainly, and in rabbits it is marked by an unconscious or semi-conscious cry or scream. This same kind of cry is always made by rabbits during the second state of narcotism from the inhalation of chloroform, ether, amylene, or other volatile anæsthetic.

"Thus far I have spoken of what may called the natural phases of this curious experiment, and what we have seen in this way is fully sustained by the observations of Dr. Mitchell. The eighth experiment related in his essay, published in the January number of the *American Journal of the Medical Sciences*, tallies in every particular with the experiment that

has been before us. In his experiment, by directing rhigolene spray on the cerebral region for three minutes, the animal, a pigeon 'was thrown into a state of profound torpor. The third minute after the freezing the head fell, the eyes were closed, and the animal fell sideways. From this state the bird made an effort to walk, and again fell into a stupor roused by falling over. These spells recurred, but further apart. There were no backward movements at any time.'

"In watching these natural stages of anæsthesia by the application of extreme cold to the cerebrum, I was very soon impressed with the fact that every mark of excitement occurred at one of two stages—viz., midway in the transition from the natural state to the state of complete stupor, and midway from the stupor to the state of recovery. These states of excitement are identical in point of place and time with those stages of preaction and reaction which I exhibited on my own body. In truth, therefore, the effects we observe are first developed on the vessels of the brain and their nervous supply, just as occurs on the peripheral surface. Primarily, there is removal of force from the nervous filaments of the vessels, and removal of tension from the vessels; there is dilatation of the vessels, excessive local evolution of heat from rush of blood, and overaction marked by exalted functional phenomena. The cold being sustained and intensified, there is universal abstraction of force, the change of physical condition known as freezing, and absolute inertia of the part itself and of all it governs. Secondarily, there is the reverse order of phenomena—viz., from torpor to reaction with excitement, and finally a return to natural distribution of force-equilibrium.

"I dwell on this point because it shows that all disturbance of nervous function marked by excess of function, such as muscular convulsion or exalted sensibility, is connected either with the stage of preaction or of reaction. In respect of reaction, and the effect of it, Mitchell comes practically to the same conclusion.

"The experiments thus far have had reference to influence of cold on the superior surface of the cerebrum, and to those cases in which the animal is allowed to recover. To what has been told I may add that so perfect is the recovery, that no evidence of after-injury need result. The animal that has been insensible with frozen brain for seven hours recognizes everything on coming round again, exactly as though it were awaking only from natural sleep.

"We can, nevertheless, when the brain is actually frozen, induce other classes of phenomena, to the consideration of which we may now transfer our attention.

"If, when an animal is placed in a state of deep torpor by freezing the superior surface of the cerebrum through the parietes, the cold be sustained and the mass of the brain be made to come more effectually under the influence of the cold, the excitability of the spinal column, even of a warm-blood animal, is greatly increased. In frogs this excitability is quickly developed, as I have already shown; but in rabbits, more time being allowed, it is equallv well demonstrated. In a young rabbit profoundly stupefied by the act of deep freezing of the cerebrum, Dr. Sedgewick, with me, watched this phenomenon of spinal excitability for more than an hour. The animal reclined on the side, and breathed much as a man who is suffering from apoplexy. There was no consciousness whatever, and, when let alone, the body was quiet; but the merest excitation, even the passing of a current of air over the body, brought on the most

determinate convulsive movements—movements quite unconscious, quite painless, but at the same time co-ordinate, showing still the governance of the cerebellum, and confined to the voluntary muscles, showing plainly the spinal nature of the excitation. By letting the cerebrum thaw, the convulsive movements readily ceased.

"In all these experiments it is best not to expose the brain substance directly to the cold, but to let the influence be exerted through the walls of the skull. When, however, the animal is quite insensible to pain, it is easy to remove the bony parietes, and to act directly on brain-matter. In this manner we may freeze sections of brain-matter, tracts, and special organs. In this way, by care in the experiment, the cerebrum may be removed altogether without destroying the action of the heart or the respiratory power. In these cases, of course, no attempt has been made to keep the animal alive, but when the facts required were obtained it has been made to sleep to death. Still there can be no doubt that a vegetative existence could have been sustained.

"An observation was made by Majendie that when the corpora striata were ablated or injured there were violent forward movements of the animal body. He accounted for this by assuming that the forward propulsive movements of the body were generated in the cerebellum and in the medulla, while the governance of the backward movements of the body was derived from the corpora striata. When, then, the influence of the corpora striata was cut off, the balance of power was destroyed, and, the action of the cerebellum and medulla coming into undue force, there were movements forward which the animal could not control.

"In destroying the functions of the cerebrum in pigeons by means of cold, Mitchell, in one of his experiments, made the freezing go so deep as to influence the region of the corpora striata, occasioning, he says, 'the violent forward movements which Majendie originated by ablating these parts.'

"In my own researches, when pigeons were under observation, I have repeatedly observed the same forward movements when the cerebrum was frozen. Sometimes the movements are rapid, but more frequently they are nodding forward acts, the same as are commonly observed in persons who fall very soundly asleep in a chair. These phenomena fully sustain Majendie's view as to the influence of the corpora striata in so far as pigeons are concerned. These are the principal facts in reference to the action of extreme cold on the cerebrum. One or two other observations have been made, and are of interest: thus in one instance Dr. Sedgewick noticed that when one-half of the cerebrum was frozen all the irritability of the same side of the body was destroyed, while the other side seemed to show some degree of irritability. But I do not dwell on this or other points, because I am not prepared to speak with the certainty which further experiment will supply.

"Influence of Extreme Cold on the Cerebellum.

"To affect the cerebellum by cold, it is necessary to direct the ether spray much lower than when the cerebrum is to be influenced, and at a point more posterior. It is difficult to freeze the cerebellum without freezing the cerebrum, but it is more difficult to freeze the cerebellum without to some extent affecting the medulla oblongata. Hence I can scarcely affirm that a pure and simple suppression of the function of the cerebellum has been obtained; at the same time the phenomena are very

nearly correct, and such divergence from the simple facts as does occur will not in the main modify the result. When we freeze the cerebellum of a pigeon, there is always produced a certain degree of stupor. This is attended after a little time with flapping of the wings and movements backward. The backward movements occur in distinct paroxysms, and are very steady in the mode of their occurrence. I have not seen backward somersaults from the operation—phenomena which Mitchell particularly describes—probably because I have observed at times when the temperature of the air was low and the reaction slow; but the backward movements have been very definite, and they may be induced in the same bird over and over again without in any way interfering with its general health or condition. On this point Mitchell's observations agree entirely with my own.

"In rabbits the phenomena, according to my judgment, are not the same as in birds. The cerebellum of these animals has been frozen alone, and in the cerebellum with the cerebrum; but in no case have backward movements been noticed. There has always been stupor, and there has always been convulsive movement of the limbs, when the cerebellum was reached, but I could not say that there was deficient co-ordination. Mitchell, in speaking of the same animal, says, in regard to the experiment of freezing the cerebellum, that there was 'apparent temporary want of power to co-ordinate the muscles,' but on all other points he appears to hold the same opinions as I have expressed above. I think it probable that the construction of a quadruped for locomotion, as compared with that of a bird, may account for this difference of action when the function of the cerebellum is cut off; or it may be that in these animals the cerebrum may be more readily influenced, and that the corpora striata may be involved in the process, by which there would be negation of action in the two contending parts.

"In considering the phenomena that are observed in birds when the cerebellum is temporarily destroyed by cold, there is one fact which beyond others stands forth as deserving of special notice. It is this fact, that the symptoms, the active symptoms presented, are due, not to any action progressing in the part really acted upon—the cerebellum—but to overaction in the cerebrum, in the corpora striata, in those parts which balance, if I may so speak, the cerebellum. The animal without the cerebellum shows evidence of backward movements—which means that, the controlling or compensating power of the cerebellum being cut off, that part of the cerebral organism which commands backward movement is allowed undue play and overcomes volition or will. Thus on one side volition or will looks as if it were an independent something—spirit or entity—standing away from the organism, and balancing one part against the other; while on the other side it looks as if it were an actual and simple physical property of the parts, inoperative in parts bereft of force, and overoperative in parts which *ought* to be balanced by the structures that have been rendered temporarily inactive.

"When we see, therefore, an animal fall backward or walk backward, because its cerebellar functions are positively in abeyance, we see the action of the great anterior cerebral ganglia. Conversely, when we see an animal pitch forward because the cerebrum is rendered inert, we see in play the unchecked forward propulsion of the cerebellum.

"Do we ask for any further proof of this law? We have the proof laid plainly before us in the course of the experiment previously to the

act of freezing, and in the course of recovery. In freezing the cerebellum, as in freezing other portions of the body, we have, if we proceed slowly, a stage of preaction. Well, during this stage of preaction, or, if we like so to call it, of pre-excitement, we call the cerebellum into undue power, and for that brief interval we get as a consequence forward movements Again, in recovery there is in the stage of reaction, if that be sharp, a period when there is once more undue force from the cerebellar centre, and then again there are forward propulsive movements, by which, in fact, recovery is first marked, and on the cessation of which the restoration of equilibrium of action and perfect volition is demonstrated. To take another illustration of similar import, we find sometimes in freezing the cerebrum that there are manifestations of backward movements, as though the cerebellum, which has not been influenced, were reduced in power. These movements are due to the stage of preaction in the corpora striata; they give way to forward movements when the freezing is complete, and they recur during recovery if there is a marked stage of reaction.

"I shall not dwell on this subject further upon the present occasion, but it could not as matter of experimental evidence be passed by because it illustrates beyond dispute how unnatural nervous phenomena may have their centre in a part not primarily and indeed not organically affected, but disturbed in function by the disorder of another and distant part.

"Influence of Extreme Cold on the Medulla Oblongata.

"When the medulla oblongata of a pigeon or of a rabbit is subjected to the influence of extreme cold by means of volatile spray, there is developed in the first place the phenomenon of disturbed respiration and symptoms of apnœa. In pigeons Mitchell has seen backward movements with alternating periods of stupor, and final recovery, but I have not seen recovery. In my experiments, whenever the medulla became so far influenced that the animal moved backward, and fell, it died from arrest of respiration. I have also in freezing the cerebellum killed a pigeon accidentally by the extension of freezing into the substance of the medulla. At the same time, Mitchell's experiments show definitely that some portions of the medulla may be frozen, that the animal may recover, and that the phenomena produced by the freezing are those of backward movement and of stupor.

"In rabbits, when the cerebellum is subjected to cold, we see first a period of excitement in which the muscles of respiration specially share. The respiration is at first sharp and rapid; this is succeeded by firm contraction, and the contraction again is succeeded by paralysis and death. These are the symptoms when sufficient time is permitted for their proper manifestation, but it is quite possible to bring the cold into such effective action as to destroy respiration instantaneously. If the cerebrum be first frozen, and then the cerebellum, one jet of spray thrown on the medulla will suffice to kill.

"The condition of the lungs, after freezing the medulla and so stopping the respiration, varies according to the period of action. If the cold is moderate and prolonged, the lungs will be left intensely congested, the course of the blood having been partly but not at once effectually interrupted by the mechanical embarrassment of the respirating machinery. If the cold is rapid in action and intense, so as to destroy the medulla at once, then the lungs are left collapsed, perfectly free of blood, and white

in their structure as snow. These same conditions of lung occur, according to the rapidity of the process, after death by apnœa from mechanical obstruction of the trachea. The same varying conditions of lung also follow death from injuries of a mechanical kind, such as blows or stabs inflicted upon the medulla.

"Influence of Extreme Cold on the Spinal Cord.

"In frogs, when the spinal cord is frozen, there may be a stage of preaction accompanied by active movements of the limbs. But this stage, always very brief and often passed over altogether, is followed by paralysis and stupor. The stupor is first to clear away, and then motion returns, but at first not in the natural way. As Mitchell very correctly puts it, 'after a few minutes the frog is able to crawl, but does not recover the power to leap, its usual mode of progression, until a longer time has elapsed. Recovery is always perfect, and there are no backward movements.'

"In rabbits the effect of freezing segments of the cord is first to produce active movements of the limbs connected directly with the part frozen; afterward, when the inertia is complete, there is paralysis of the limbs, and, according to the extent of surface frozen, prostration. Another marked phenomenon, especially when the freezing is in the cervical region, is stupor.

"In pigeons and chickens freezing of the spinal cord in the cervical region leads to backward movements, as when the cerebellum is frozen, with intervening fits of stupor, but with perfect recovery. Dr. Mitchell has fixed on the point in the spinal line where the backward movements cease to be elicited by cold. His observations are thus stated: 'It results from these experiments and others that at or about the fourteenth vertebra, counting from above downward, we cease to notice the backward spasms and stupors, and see only signs of weakness or of tetanic rigidity in the legs; usually, these phenomena come on some time after the freezing, and reach a maximum within ten minutes.'

"Summing up the facts as to the effects of cold, Mitchell also adds: 'It appears thus far that in pigeons the application of cold to the cervical spine occasions, after a brief period, peculiar backward movements resembling those which have been previously produced by mechanical injury to the cerebellum. These abnormal actions are, in extreme cases, backward somersaults, followed by spells of backward walking, and accompanied with spasmodic movements of the head, to be fully described hereafter. In milder cases only the backward walking occurs. Both of these forms of constrained movement are met with when the cerebellum has been chilled. A further series of experiments determine that it is immaterial whether the spine be acted on behind, at the side, or in front.'

"In this lecture, gentlemen, I have endeavored to confine myself to the recital and the demonstration of simple experimental truths. In my next lecture I shall view this subject from its practical rather than its experimental side. Meanwhile, and before we approach any theory or connect what we have seen here with what we have seen in disease, let us epitomize the facts we have learned. These are as follows:

"1. Nerve tissue in living animals undergoes the process of freezing at 16° Fahr.

"2. In the process of freezing any nerve structure the cold acts primarily on the vascular system of the structure, causing, firstly, a stage of

preaction, or exaltation of action; secondly, a stage of inertia, or temporary death; and thirdly, in recovery, a stage of reaction, also with an exaltation of action.

"3. Nerve substance, when so reduced by cold as to be incapable of conveying sensation, may yet convey an electrical current; but when nerve structure is absolutely frozen through in every part it ceases entirely to act as an electric conductor.

"4. The cerebrum of a living animal may be frozen. In this state the consciousness of the animal is lost, but the functions of organic life remain the same. The animal thus placed is in a state of artificial hybernation from which it may recover. On recovery the brain does not seem to have lost any power. The phenomena are those simply of awaking from profound sleep.

"5. The cerebellum may be frozen, and afterward complete restoration of its functions may be secured. In birds, freezing the cerebellum produces backward movements; in rabbits, convulsive muscular action.

"6. Complete freezing of the medulla kills by destroying the respiratory power.

"7. The spinal column may be frozen and restored. In birds the process of freezing the cervical part of the column produces backward movements with intervals of stupor.

"8. By destroying, under the influence of cold, one part of the nervous system, we may pervert the function of another part. Thus, by arresting the functional activity of the cerebral mass, we can exalt the function of the spinal cord; and by destroying the function of the cerebellum, we can exalt the function of the anterior cerebral ganglia, or *vice versa*."—(*Med. Times and Gazette.*)

"*Chemistry of Ripening Fruit.*—Dr. Dupré has been publishing the results of his investigations into the chemical changes which occur in fruits which are passing from the green to the ripe state. In a paper lately read before the Chemical Society, he showed that although the relative quantity of acid in fruit diminishes as the fruit ripens, the absolute quantity remains tolerably constant, or, at least, diminishes but slightly. There can be no doubt, therefore, that the sugar increases in quantity, and it seems not unlikely that the development of the sugar may take place through the action of the acid in a manner similar to the production of sugar from starch by the action of dilute acids. Dr. Dupré states that a hundred average-sized apples gathered on September 13, October 12, and November 16, were found to contain respectively 2·5 grammes, 1·9 gramme, and 1·8 gramme of tartaric acid—a result which tends to bear out his opinions expressed above."—(*Ibid.*)

Cancrum Oris.—Dr. Cochran read a paper before the Medical Society of Iowa (*Med. and Surg. Reporter*), "embodying the details of four cases of cancrum oris occurring in his practice, and the treatment instituted therefor. The attention of the profession was particularly called to the fact that the disease is liable to be confounded with salivation arising from excessive use of mercury. He stated that a recent instance of prosecution for malpractice had been instituted against a respectable practitioner, by reason of evident misconception on this point."

Explosion of Rhigolene from Sun-Light.—It is stated (*Oskaloosa* (Iowa) *Herald* and *Cincinnati Journ. of Med.*) "that Dr. M. L. Jack-

SON recently procured a newly invented compound—prepared for dental operations—called *Rhigolene*, which will explode if exposed to the light for any considerable length of time; he placed it in a dark room, and supposed all was safe. On Thursday last, while engaged in his office, he heard an explosion in the dark room, and rushed in to see what had happened; he found the room full of gas, and made for the outer door. He succeeded in getting out, and closing the door behind him, when he fell insensible upon the floor. Upon the return of consciousness, he made a careful examination, and found that the window-shade had been partially drawn aside, admitting a ray of light which struck the bottle containing the dangerous compound, and hence the explosion."

Disinfectants.—"MR. CROOKS has shown that the favorite disinfectant —namely, chloride of lime—is about the least efficient of any of those substances which are reputed to possess disinfectant qualities. Chlorine itself is very little better. True, it will destroy the virus in time if one uses enough of it; but as it acts by way of oxidation, and as living virus resists oxidation longer than dead oxidizable matter, it follows that before chlorine gas can attack a virus everything else that it can oxidize will be oxidized first—everything in short, such as sulphuretted hydrogen. And if chlorine is so extravagant and questionable a disinfectant, what can possibly be expected from a sprinkling of chloride of lime, perhaps one of the most adulterated disinfectants known—adulterated in the sense that, as commonly sold, it contains an excess of carbonate of lime and chloride of calcium, and not more than about 20 per cent. of chlorine in a form that is available for disinfection?

"*Secondly.* Mr. Crooks has shown that there exist in sulphurous acid and carbolic acid substances which are absolutely destructive of every kind of living thing of low organization, such as cattle plague virus is supposed to be—that these substances not only destroy the virus, but attack it at once, and, moreover, arrest all tendency to putrefactive decomposition in animal matters with which they are mixed."—(*Med. Times and Gaz.*)

"*Liquor carbonis detergens* is recommended as a new form of antiseptic for local use (*Med. Times and Gaz.*). It is an alcoholic solution of coal tar, containing, we presume, the carbolic, phenic, and other acids, with dark tarry matter, and differing from carbolic acid, as the liquor cinchonæ does from quinine. It readily mixes with water, forming a permanent emulsion, and in various strengths is available as a mouth-wash, a gargle, an injection for fetid uterine discharges, cancer, retained placenta, etc., gonorrhœa in the female, foul ulcers, sloughing sores, and all maladies dependent on, or complicated by, parasite beings, lice, fungi, etc. It is also used combined with soap."—(*Med. and Surg. Rep.*)

Reduction of Metals by Capillary Action.—The Paris correspondent of the *Chem. News* says: "M. BECQUEREL placed before the eyes of the Academy of Sciences several specimens of metals reduced and precipitated by capillary action. In order to answer the objection that these phenomena of reduction or precipitation might be attributed to the action of the alkalies of the split glass tube, he employed polished plates of rock crystal, applied one against the other so as to leave only a very small interval, and produce colored rings; he has thus obtained perfect reduc-

tion of several metals. The interval between the plates must be varied according to the different metals, and he has obtained by this means the reduction of such metals as cobalt, nickel, copper, gold, etc. For the reduction of gold, for example, the space between the plates must be less than that for copper. When the solution is dilute, there is no further reduction of metal, but a precipitation of oxide."

—

Flowing of Solids.—"M. TRESCA read a second part of his researches on the flowing of solids through simple or multiple, circular, polygonal, and lateral orifices, and described a great number of interesting particularities which confirm the results of his former experiments, and undoubtedly prove that the molecules of substances of the stiffest nature in appearance possess the property of moving independently generally in parallel directions. The flowing takes place in concentric zones or calottes more or less elongated, which sometimes are folded together, etc."—(*Ibid.*)

—

"*To color Gold.*—Different shades of color are given to ornaments of gold, by exposing them to chemical agents, which dissolve out a portion of the copper and silver alloy, while they have scarcely any action on the gold. The French jewelers possess a number of recipes for giving color to gold, the most common of which is a mixture of two parts nitre, one part sea salt, and one of Roman alum. The jewels are kept in a solution of these chemicals, at a boiling point, from fifteen to twenty-five minutes, when they are then taken out, and washed in water, and the operation is finished. The surface of the gold is dull, but perfectly uniform, but can be made lustrous by burnishing. They lose about one-sixteenth of their weight by this operation."—(*Drug. Circ.*)

—

"*Powerful Lens.*—In the focus of the powerful lens made in London for Mr. Parker (which measured 3 feet in diameter, 3 inches thick at the centre, and weighed 212 lbs.) the most infusible metals were instantly melted and dissipated in vapor, and the most stony substances were vitrified."—(*American Artisan.*)

—

Powerful Galvanic Battery.—"The large battery of the Royal Institution, employed by Sir H. Davy, which consisted of 2000 pairs of 4 in. plates, melted platinum, quartz, the sapphire, magnesia, and lime, like wax, both in vacuo and in the atmosphere, while charcoal, plumbago, and the diamond were rapidly dissipated in the form of vapor."—(*Scientific Journal.*)

—

"*Purification of Water.*—M. BOOTH, of Birmingham, England, has lately made known a very simple process for disengaging from water all organic matters. By this method it is sufficient to prepare a neutral solution of bisulphate of alumina, and add the water to be purified in the proportion of one ounce to 435 gallons. As soon as this is done, a cloud is formed in the liquor, and flocks rapidly descend, taking to the bottom all organic matters, and debarrassing the water of all coloring matter, and disagreeable taste and smell. In six or eight hours the deposit is complete."—(*Journal of Applied Chemistry.*)

THE

DENTAL COSMOS.

NEW SERIES.

Vol. IX. PHILADELPHIA, SEPTEMBER, 1867. No. 2.

ORIGINAL COMMUNICATIONS.

EPIPHORA.

BY J. H. M'QUILLEN, M.D., D.D.S.,

PROFESSOR OF INSTITUTES OF MEDICINE IN THE PHILADELPHIA DENTAL COLLEGE.

My attention was recently directed by a fellow practitioner (who called to consult me in relation to the matter) to an interesting case of *epiphora*, in which the flow of the lachrymal secretion from the outer canthus of the right eye, when the head was held one side in operating, proved at times a source of much annoyance. Failing to recognize the cause of trouble, and regarding the difficulty as an evidence of growing weakness of the organ, the gentleman was not only concerned about the existing defect, but apprehensive that it might lead to something worse. The edges of the lids of the right eye were red and slightly inflamed, and the cheek for a short distance from the outer canthus somewhat excoriated by the tears. The conjunctiva, however, presented no appearance of inflammation, and the left eye was entirely unaffected. After a few questions, in which the patient stated that he only experienced inconvenience when holding the head in a certain position during the performance of his operations, I informed him that the difficulty was mainly if not entirely due to that, for under such circumstances the secretion, in place of passing to the inner canthus, where the natural outlets, the *puncta lachrymalia*, are situated, was compelled by gravitation to flow in the direction it did, and that by frequently laving the eye in cold water and avoiding as much as possible holding the head in the objectionable position, the difficulty would disappear. The advice was adopted with satisfactory results. I make mention of the case, as it may be of service to others who are subjected to the same annoyance. It is advisable, however, to remember that the causes of *epiphora* are innumerable; and that anything which excites or stimulates the ophthalmic branch of the fifth pair of nerves; a foreign body touching the conjunctiva; lachrymal calculus; strong light suddenly thrown on the eye; sympathy with the joys or

sorrows of others; teething, disordered digestion, etc., will cause it. Hence, it is evident that of all the nerves of the body none sympathize more with the rest of the nervous system than the fifth pair; and when their intimate connection with the eye is considered, the numerous remote causes which produce disease of that organ will cause no surprise to those who have made it as careful an object of study as the well-informed dental practitioner.

In this connection, it will not be out of place to direct attention to a singular statement made by Mr. Mackenzie, in his work on the "Diseases of the Eye," viz.: "The tears are at all times an irritating secretion; the conjunctiva is instantly reddened when they flow, and although we were to grant that this was consentaneous with the determination of blood to the lachrynal gland preceding the discharge, yet we observe that if the tears are so profuse as to run over on the cheek, the skin with which they come in frequent contact becomes inflamed and excoriated."

The fact that the lachrymal glands in health are constantly though insensibly secreting their peculiar fluid, which is needed to keep the conjunctiva moist, and would inflame if not kept so, indicates the incorrectness of the above statement. When flowing over the skin, as in *fistula lachrymalis*, it proves irritating, it is true, and the same holds good with regard to the saliva when passing for any length of time out of the mouth and over the chin; but this is no evidence of the general acridity of these fluids. The simple fact is, these secretions are intended to lubricate and protect the mucous membrane, but when coming in contact with the skin, they are out of place, and prove irritating to it; and simple water, if kept constantly applied, would prove equally so.

THE CHARACTERISTICS OF THE BLOOD.

BY PROF. RUFUS KING BROWNE, M.D.

(Being Report of Remarks made before the New York and Brooklyn Dental Societies, on the Physiology and Pathology of the Circulation.)

(Continued from p. 17.)

The opinion generally received is, that the human red blood corpuscle is a cell with red contents, the nucleus of *which has disappeared*, or else it is the free nucleus of a cell—and here the question is dismissed.

But the red blood corpuscle really is one consisting of matter of different degrees of density in different parts, being dense externally, but gradually becoming softer, so as to approach the consistence of fluid toward the centre.

I have never seen the cell-wall said to exist, neither have I been able to verify the often repeated assertion with regard to the passage of liquid into the interior of the corpuscle by endosmose; its bursting, and the escape of its contents through the ruptured cell-wall.

When placed in some liquids, many of the corpuscles swell up and disappear, but the ruptured cell-wall cannot be discerned. The red blood corpuscles from the same animal differ in character in a much greater degree than observers generally seem disposed to admit. Some are darker and harder than others; some are so transparent as to be invisible without the greatest care, and some may be found which are not more than the third or fourth of the size of an ordinary blood corpuscle. These small corpuscles can be colored with carmine in clots after death; but in some instances certain of the corpuscles within the capillaries of a stained tissue have been colored. Those corpuscles like the first named were very much *smaller* than the white corpuscles, which are always very readily colored, and did not exhibit the well-known granular appearance of the white. They were in fact *young* red blood corpuscles.

The majority of the red blood corpuscles of the human subject are not to be colored, if the same process is employed as that by which the white are readily colored. But the granular or nucleated corpuscles of the embryo are readily colored. The nuclei of the corpuscles of the frog become readily colored, but the external portion which is colored naturally, is not *tinged* by carmine.

In winter the capillaries of the frog contain numerous oval corpuscles, surrounded by a very thin layer of the external colored portion, so that they are not more than half the dimensions of the corpuscles when the animal is active. The nucleus of the frog's corpuscle consists of growing matter.

Of the red corpuscles of mammalian animals, some are destroyed by certain chemical reagents which have scarcely any action or none on others; and they are not all altered in the same degree or with the same rapidity by the action of water, weak alcohol, syrup, and various fluids. Nor do all the corpuscles in a drop of blood undergo the same change immediately after it has been drawn from the living body.

The red corpuscles of man are probably formed from the matter of the white corpuscles. A particle set free in the current of the blood would appropriate the nutritive material there, and would grow. During this young stage or period, it can be colored; gradually, however, the concentric material increases, and the germinal matter of the centre no longer *is* germinal or growing.

The corpuscle then undergoes another series of changes. It begins to be slowly dissolved away at the surface, and at last it is, without doubt, entirely converted into substances which are held in solution by the serum, and its place is taken by a new corpuscle. But the character of the mammalian red blood corpuscle can be proved in this way. Guinea-pigs' blood crystallizes very rapidly in tetahedral crystals, and if the process be carefully watched in a drop of blood, which has been treated with a very little water, and covered with thin glass, and sometimes even without the

addition of water, certain corpuscles will be seen to become angular, and four or eight prominent angles will be observed, while others will exhibit the stellate appearance familiar to every one. In this remarkable case, then, the entire blood corpuscle may be seen to crystallize. Now certainly there can be no membrane nor anything like it here. For the crystals may be actually seen to coalesce, and larger crystals form, but no membrane can be seen. Two crystals may come into close contact and gradually become incorporated, which, of course, could not take place if they were invested with a membrane. Some of the blood corpuscles may be seen incorporated in the crystalline mass, but these are entire corpuscles—probably young ones—not merely cell-walls.

The current of blood in the body is the main road by which the oxygen is carried along. It constitutes the means of communication for the intercourse of the body with the atmosphere, and serves for import as well as export. The blood corpuscles which are continually floating about in the stream constitute the exact analogue of a fleet of vessels laden with oxygen, and carrying the cargo to the most distant part of the system and all the different organs, where part of it is at once consumed for works which are going on there, while another part is stored up and accumulated for future use. The carbonic acid is the return-load put on those Liliputian vessels, each of which are only visible under the microscope, and a much larger number of which may steer in a large stream than in a small rivulet. In spite of their tiny form, they are able to transport forward and backward four pounds and a half of oxygen and carbonic acid in the twenty-four hours without noise or commotion, to condense within themselves more than four hundred litres of oxygen from the atmosphere, and at the same time to give off nearly as much carbonic acid, without any part of their speedy and airy work being so much as guessed at by the observer. They export much more carbonic acid during the day than they import oxygen; and during the night in quietude and rest, they bring back rich treasures of oxygen to supply our wants, so that our expenditures the next day may be provided for without waste of capital.

There can be no doubt that there is the most remarkable difference in the rate of passage of the liquid portion and the red solid portion, or corpuscles, of the blood. The latter have a rapid motion within the general motion of the liquor plasma, and constantly, and with varying rapidity, advance *through* the plasma. Their specific motion constantly tends to hasten the plasma itself forward. Passing at every point onward through this fluid, their movement causes innumerable lines of advance, which the plasma itself, propelled solely as an undivided column of fluid by the heart, would not have.

It is for this reason that a far larger proportion of red globules to plasma always exists in the veins. This disproportion or excess of the red corpuscles in the veins as compared with the arteries, is continued to

the left chambers of the heart—and even into the lungs, where it has often been seen that the capillaries, unlike those in other parts of the system, are crowded with the *red corpuscles.*

PATHOLOGY—CONGESTION.

This feature of the circulation, which I have never doubted since my earliest observations of it, really accounts for various local congestions, which, anatomically considered, consist of a great disproportion of red globules in a certain capillary district, to the volume of the plasma,—the greater abundance or crowding of the red corpuscles interfering with and delaying, or even transiently staying their free and rapid movement; the evident consequence on the rate of flow of the plasmatic portion being to dam or stay its progress by the same diminution or cessation of advance. In proof of this we may reflect that if the *same* proportion of plasma and corpuscles—in a given anatomical section of the column of blood—were uniformly together, no such stasis could occur while the blood channels remained open. Of course, this phenomenon of congestion implies that the column of blood in advance of the capillaries, named in the venous radicles, corresponding to the congested district, is also in a similar state of crowding of the corpuscles, and of mutual interference with their rapid and special progress.

The well-known, and already mentioned fact, that *one* corpuscle will *delay* or cease its progress to permit the advance of its fellows, is sufficient proof that they have a motion not one with and the same as the flow of the plasma. The fact forces upon us a recognition of the further fact, that in case of such delay, a corresponding portion of the plasma is also delayed by the halting of the red corpuscles—a phenomenon which is *general* to the tide of plasma when the whole calibre of the capillary is filled with an unwonted number or a crowd of red corpuscles. In no other way, as I conceive, can we pretend to explain histologically the phenomena of local congestion of a transient tenure.

But we must consider that, except in those morbid instances, this accessory motion forward is a continuous one throughout the circuit, and not a phenomenon in which the greater rate of passage of the red corpuscle is confined to one part of the circuit. Nevertheless, for this very reason, it is seen that in that part of the system where the flow of the plasma is freest, namely, in the arterial system, the lateral pressure of the regular contractions of which act to move forward *the column of plasma itself*, the red corpuscles will have the freest movement, and hence advance most rapidly in the column of liquor of the arterial blood. The consideration of these facts impels us to search for some physiological reason or end, which is accomplished by the rushing through the plasma at various lines of advance of the blood globules. Has it anything to do with the delivery of the oxygen taken up before the blood reaches the general arterial system?

It is admitted that the taking up and transport of the air-oxygen is due to the red corpuscles; but that it has not a permanent hold upon them is certain. In arterial blood, that is, blood which has just received its oxygen, there is an impletion of the red globules with that substance—which they carry onward *throughout* the arterial system. Here their motion is accelerated through the column or menstruum of plasma. It is generally represented that the red globules deliver their oxygen to the tissues, which means the anatomical elements in near contact with the outer surface of the capillaries. But few physiologists can, on reflection, believe this. For the red corpuscles hurry past the different sections of tissues, through which their channels pass, at a very sensible remove or distance from those tissues. They do not even come in contact with the inner surface itself of the capillaries.

It can hardly therefore be possible that they yield any part of their gaseous charge to the tissues. On the other hand, however, the plasma of the blood, and particularly a part of the substances it holds in solution, does, according to well-known laws, permeate the capillary walls, and thus deliver something through them to the tissues beyond. It is in this transaction that we have the conditions of supplying the oxygen to the tissues, provided it is held in the plasma. And this undoubtedly is the fact. The red corpuscles lose their oxygen progressively as they advance toward the ultimate arterial structure, giving it to the plasma itself. Their free movement, accessory to that of the liquid portion of the blood, is the very condition of this delivery. By the time they have reached the venous radicles, they are depleted of oxygen, and now they commence reversely to become impleted with the carbonic acid with which the venous blood is charged. Charged with that to the full from their less speedy rate of progress, they reach the lungs, and there undergo depletion. In this latter part of the circuit, however, they only share with the liquid portion of the venous blood, the carbonic acid it continually holds. And there is reason to believe that the loss of carbonic acid in the capillary lung structure is as much that from the plasma as from the globules. At the lungs, the plasma, therefore, yields its excess of carbonic acid as well as the globules, just as previously it had in other parts of the system yielded *its oxygen*. The continuation of this process endlessly forms the oxygenation of the tissues by means of the oxygen-inspiring capacity of the red corpuscle.

It is the plasma which delivers the oxygen delivered to it in every part and throughout its column by the swarm of globules, which, as they course and plunge through it, deliver their oxygen. The form in which it connects with the plasma is precisely that in which, with the corresponding portion of plasma, it is yielded to the tissues.

In examining the red blood corpuscle, it is found to undergo a change of outline. It becomes crenated. The immediateness of this phenomenon,

even when the corpuscles were not permitted to lose any part of their fluid composition, nor to be exposed to the air, led me to regard this change as the same in kind, though differing in degree, as it regularly undergoes, first in becoming impleted with oxygen, and next in losing it. The actual taking up of oxygen, and the loss of it in a body of such character, could hardly occur regularly in alternation and succession without change of form; hence it is probable that at all times, on losing its oxygen, the blood globule passes from its completely rounded, smooth, disk-shape to its shrunken, or what under a more complete loss of its oxygen, outside of the body, is its crenated and stellate shape. These regular changes fit it at last to lose the cohesive property of its soft, solid particles, and finally pass into viscid or soluble form in the plasma, to enrich it with its substance, or in part to be excreted from the system.

The fibrillation of the plasma itself is due not to oxidation, but to immediate loss of oxygen on coming in contact with the atmosphere. If the same phenomenon occurs in wounds and lesions, or extravasations, it is because its constant oxidation is not kept up by the continued circulation throughout of the red corpuscles.

QUACKERY vs. LEGISLATION.

BY JNO. C. K. CROOKS, M.D , NEW BALTIMORE, MICH.

"Strange there should such a difference be."

In an editorial in the July number of the Dental Cosmos, some doubt is expressed as to the propriety of legislative action for the purpose of suppressing quackery in dentistry. Looking at the subject in the light of *expediency*, we might, by a bare possibility, differ, but in the light of right and justice there ought to be but one opinion, and that upon the side of *the most stringent legislation.*

Legislation upon all subjects is based upon the broad *law* of *reciprocity*, and although occasionally our legislators generate mischief by getting outside the pale of this law, still I can safely assert, that *difficulty never arose from a statute clearly grounded upon this foundation principle!* If I perform an act which interferes with the rights of my neighbor, it is, in the absence of law, a proper subject for the legislator, particularly if that act is of any magnitude in its consequences. It matters not what that act may be, *only* that it interferes with my neighbor's *natural rights.* If I announce myself as a skillful architect—a master-builder, when I know nothing of the business, and find employment as such, am I to be held responsible for all the waste of time, material, and money which would necessarily follow such ignorance? Am I not guilty of *fraud*—of interfering with the rights of my neighbor? If I advertise myself a lapidary, and a precious stone of great value is placed into my hands for

proper cutting, and I utterly spoil it, would I not be considered an offender—ay, would not the law hold me as such, and impose "damages" commensurate with the wrong inflicted? If I publish to the world that I am a surgeon, and am employed as such, must I not answer to the charge of "malpractice," if I commit egregious blunders and my neighbor thereby suffers for it? To all this, if I mistake not, no one objects but the culprit himself. Then, do we not so far agree as to the justice of that legislation which makes a man pay a penalty for any infringement upon the rights of his neighbor?

Yes, it may be said, "we agree;" "we never did differ upon the propriety of *such* legislation in regard to this matter, and we can make the *quack in dentistry* pay, under a charge for malpractice, for all of *his* unskillfulness!" True, we *may*, but is not an "ounce of prevention worth more than a pound of cure?" In this matter of legislating concerning the professions, are we not all wrong in this country? We place the ignoramus and the educated professional gentleman upon the same footing; they are to run the gantlet side by side, and over the head of each is held alike the rod of pecuniary damages! The educated man enters the lists, and seldom if ever feels the lash, *because his skill protects* HIM; the quack does the same and *he* never feels it for the best of reasons—*he is almost invariably irresponsible!* Without means, he cannot pay for the wrongs he inflicts, and he becomes, in fact, *a licensed social vulture to abuse the confidence and feed upon the substance of the community where he dwells!* Is this enlightened legislation? On the other hand, if we protect honest skill, do honor to genuine merit, and put the strong hand of the law upon ignorance and charlatanry, do we not perform a service to the public in every way? By such legislation, whose rights are trampled upon? Not the rights of the *public*, certainly—neither the rights of any true professional gentleman,—nor can it be the rights of the quack! If *his* liberty is curtailed—if his rights are interfered with—just so much does the law against stealing interfere with the thief, or the law against murder with the murderer!

To put the question in another form: an individual applies to a person, who represents himself as a dentist, to have a tooth filled, and the cavity is excavated to the nerve and the filling "driven home" upon that sensitive organ, or proper excavation is omitted, and a filling placed over a half decayed filament of beef; or a large gold filling is paid for when the most of the cavity is occupied with cotton; or filling after filling is inserted only to be lost in a few weeks or months. *Where is the redress?* Not in the courts for malpractice, damages being claimed. Why? *Because the costs of the suit might be greater than any pecuniary measure of the injury sustained*, and the poor, suffering patient must pocket his wrongs in silence. The *injury is past*, but *the payment of liberal attorney's fees is in the future*, and a *possible* defeat, through

the "uncertainty of the law," stares the injured one in the face like a frightful spectre. Whichever way he looks he sees calamity, and he is compelled to turn away with loathing and disgust.

These are not cases based upon supposition, but cases of almost every-day occurrence, certainly in *my* experience, and can be reached only by statutory provisions *to prevent.* A glaring, flagrant, and extraordinary case of malpractice, where the wrong done is great in its consequences, might be reached by a charge to that effect; but how much better here to prevent than to allow, and then apply a remedy subsequently *which can never reach the injury inflicted, or wipe out its bitter remembrance!*

But what is the remedy offered by those who differ with us upon this subject? In quoting from the editorial referred to, we discover that "the true remedy now, as in the past, is in the hands of the profession. It is *insisting upon the most thorough preparation on the part of those seeking to enter its ranks.*" Now this all sounds very well. It is a commendable thing to "insist upon the most thorough preparation;" but *who is to "insist?"* Who is to respond to the administration of this antidote? *Will the legions of quacks which infest the country?* What think you, will *they* respond with alacrity and elevate *their* pupils so much above *their own level?* Just as well should we expect that "water would run up hill," and disobey the familiar laws of nature which control it?

The regular profession has always "insisted" upon this very measure. By their hands the seeds of charlatanry have been scattered most sparingly. Like "good and faithful stewards," I believe they have always gone to their labors, while the trouble has ever been in that quarter where "they climb up some other way." It is in the ranks of the "six weeks' dentists" where knowledge is "picked up" that the professional canker worm has its favorite haunts. Then, in a day in which there is such a tendency to superficiality—when "shoddy" leads the van, what can we expect but just precisely what we see upon every hand—a cloud of impostors arising, as thick almost as the locusts which filled the camp of the Egyptians?

No; this is entirely out of the reach of the profession proper. It is not a want of vigilance upon their part, but a bold, unscrupulous onslaught of quackery—a FRAUD—and as such comes properly under the remedy—LEGISLATION.

I have full faith and confidence in this species of legislation, and always have had. It is successful elsewhere; why cannot it be here? In England, and throughout her provinces, legislative enactments to regulate the practice of medicine have quite driven quackery from that particular field; and, what is of as great importance, they have taught the public, high and low, to hold the educated practitioner in the highest esteem. Such, indeed, is the necessary consequence of such a procedure

against ignorance and knavery in any department of business, professional or unprofessional. Let the mountebank and the cheat be proceeded against summarily, and their fraudulent transactions exposed, how long would it be before they would fall into utter disrepute, and get the contempt of every respectable person in the land?

Gift enterprises, prize schemes, lotteries, drop games, Peter Funk operations, anything and everything, the followers of which get money for which they pay not an equivalent, have come to grief under the law, and now, so low have they fallen in public opinion, that they are driven into the lowest dens of wickedness and vice, there, cannibal-like, to feed upon each other.

So would it be with quackery in our profession. Let the law set up a *standard;* without aught else, would those who could not or would not reach it, retain the confidence of the people? But, in addition to this, *let it be denominated* "FRAUD" *by the law* (as it is), getting money under "false pretenses," and receive the penalty which attaches to "fraud," how long would it continue to lift up its head and look honest people in the face? It would be "the handwriting upon the wall" to this poor, worthless, dental Belshazzar, and with knees smiting together, he would slink away to a lasting hiding-place!

CELLULAR PHYSIOLOGY.

BY HENRY S. CHASE, M.D., D.D.S.

(Being a portion of a lecture read before the Iowa State Dental Society, in July, 1867.)*

We have thus glanced over the field of Cell Anatomy and Physiology without stopping to inquire into the peculiar functions of the cells of different organs and tissues of the body, nor do we intend at present to do so; but let us inquire a little more particularly into the general formation and functions of CELLS.

WHAT ARE CELLS? *They are the ultimate microscopical organs in which all life processes exist and take place.* They are the manufactories in which all the tissues of the body have been spun. Everything that grows or has life is made up of a cell or cells, from the lowest to the highest organization.

Every perfect cell is a trinity; there are three cells in one, namely: the outer form, which has an envelope and contents; the nucleus, which has an envelope and contents; the nucleolus, which also has an envelope and contents. The envelopes are simple membranes; the contents are plasma or food for the cells and tissues, and also for the various secretions of different organs.

* These views are based on "Virchow's Cellular Pathology."

All growth is by a reproduction of cells. Cells multiply by a power inherent in themselves. No cell which is imperfect can reproduce itself. Every perfect cell has a nucleus and nucleolus.

It is by the power of the nucleolus that the nucleus can multiply, proliferate, or reproduce. The nucleolus must be the ultimate seat of life-power in the cell. Here must lie the directing power by which a cell is to become in its proliferation different in form from itself. If every cell, in its proliferation, merely reproduced its own form, then there would be no variety of form in tissue or organs, and the whole animal or vegetable structure would be homogeneous.

A sponge may be taken as an example. Cells may exist and perform certain functions without having the power of reproduction. A mule can perform all the necessary work required of an animal, without the power of reproduction. So of the ox. A liver cell can make bile without a nucleus or nucleolus; and so can a cartilage cell perform the act of nutrition for the tissue to which it belongs without the power of proliferation. So also can the red blood cells perform *their* duty as unity, as well as in trinity. But in disorganization of tissue by disease, or loss of tissue by mechanical violence, no healing process can take place without a reproduction of tissues, a proliferation of the cellular elements surrounding the vacancy.

A cell may be more than perfect, as well as less than perfect. For instance, a muscle cell lying on the edge of a muscle fibril has, in addition to itself, the fibril, which has been produced by the cell of which it is part. So of connective tissue cells, etc.

We have seen that a perfect cell consists then of—

1. A cell wall.
2. An intercellular substance, plasma, food.
3. A nucleus.
4. A nuclear plasma.
5. A nucleolus.
6. A nucleolar plasma.

The intercellular plasma is undoubtedly that which is received from the blood by osmotic action in the walls of the capillaries, and is the food or material which the CELL MEMBRANE transforms into the various products under its care. The intranuclear plasma is the food for making new cell membranes and contents in the act of reproduction.

The intranucleolar plasma enables the nucleolus to perform its function aright, by nutrition. Each of these plasmas may have relations to each other unknown to us, especially in producing osmotic action, and the metamorphosis of food.

Undoubtedly cell action has much to do in producing the circulation of the blood through the capillaries, for it is well known that capillary circulation is often entirely independent of the action of the heart and larger

arteries. Many local inflammations occur without increasing the frequency or force of the general circulation.

There are representative or typical cells. For instance, the human ovum is the typical cell of man. This is more than a simple perfect cell; for it has the power and destiny to proliferate and differentiate cells of all the various kinds that are found in the human body, and to cause these differentiated cells to build up organs in a specific form, so that the whole result shall be a perfect human being in all its parts and relations.

If this typical cell had not this power, then it would merely reproduce itself, and the result would be a mere *mass* of cells precisely like the original.

Now, then, is not the nucleolus in every cell of the body a delegated typical cell by which the cells of one tissue can be differentiated, and so form different tissues from those in which they make their own home? The cells of mucous tissue, periosteal tissue, and cartilaginous tissue can transform themselves into bone corpuscles when necessary.

The typical cell of one animal can never become the typical cell of another entirely different animal. Therefore, the human ovum must always produce a human being, and nothing else, under the natural laws of reproduction.

The junction of the male and female representative, or typical cells of the horse-kind, reproduces a perfect animal of that type, which is again capable of reproducing itself. But the union of the typical cell of the horse-kind with that of the ass-kind produces an animal of no representative kind, which has no typical cell within it which can reproduce its kind. The mule cannot reproduce itself. It is an imperfect animal, an abortion. It can, like the uni cell, perform a certain function which is work, or nutrition, but it cannot reproduce itself, and the end of its life is its finality.

This is certainly a merciful and wise provision of the Creator, otherwise there would be no stability in forms, none in species. An animal cell may always be distinguished from a vegetable cell by observing what it feeds upon. The animal cell cannot feed upon inorganic substances until they have been either vegetablized or animalized. The vegetable cell must first prepare inorganic material within its own walls, and thereby give it a certain degree of viability before the animal cell can appropriate it and make it a portion of itself.

Inorganic matter may become *organizable* by some specific power which shall force its ultimate atoms in the specific form (whatever that is) which will enable the vegetable cell to incorporate its atoms into its own tissue, cell-membrane or contents. This matter can, however, only be incorporated into this cell but by being exactly like the atoms already previously existing in the cell. And when it has thus taken its place, it is of course *living* matter or vegetablized matter.

A vegetable cell being an organ, the atoms thus appropriated have become organic, and are now capable of being animalized, or being incorporated into the animal cell, and become a living portion of it.

Organic animalized atoms are the only *living* atoms in an animal cell, and are the only ones that can be used for food or the reproduction of tissue. Other atoms there may be which remain there inert, and are merely tolerated by the cell. Others there are less persistent which are received and cast out again into the general circulation. The process of tattooing is an example of this. The cells have no power either to appropriate the inorganic atoms composing the India ink, or to cast them out. If the general organism should expel them, the cells containing them would necessarily be expelled also.

The experiment of giving inorganic food to animals has always resulted in failure or disaster. No well-authenticated successful cases can be found to prove it otherwise.

The study of cell physiology has proven that there is no central seat of life. There is no tissue or organ of the body, nor even several of them united, such as the brain, nervous system, heart, lungs, etc., which can arrogate to itself or themselves the life-power. Life-power resides equally in every triune cell of the body, and it is the aggregation of the life-power in the delegated typical cells or nucleoli that constitutes the life of the animal or plant.

MICROSCOPY OF THE TEETH.

(Continued from p. 591.)

BY S. P. CUTLER, M.D., D.D.S., HOLLY SPRINGS, MISS.

I HAVE said that in extracting a nerve pulp from a tooth the nerve fibrils are taken off close to the inner wall of the pulp cavity. Suppose these fibrils were not quite as large as the tubuli; that they did not quite fill the tubuli, and that they even did not bind or fasten themselves in the interenamel membrane in any way, and that they possessed considerable strength, they then could not be withdrawn, from this cause, namely, the tubuli are not all the way between one bifurcation and the next even in size, but are expanded and contracted alternately during their whole extent; or, in other words, there is a regular succession of bulbs or beads which would sufficiently bind the fibre to prevent its leaving the tube.

This beaded or baccated appearance is more strongly marked in some situations than in others, and in different teeth there is a noticeable difference, though never entirely absent in any.

Some have entertained, and I believe do at the present time, the idea that the tubuli do not contain any nerve filament at all; but instead, a nerve fluid capable of being put into vibrations, and those vibrations im-

parting sentient impressions to the pulp itself, something like the impress of the drum of the ear by atmospheric waves. Any such notions are, to my mind, exceedingly erroneous, and cannot be sustained by facts.

It is a well-established fact in physiology that, where there are no nerve filaments there can be no pain from any cause produced, and that all acute pain is received by minute nerve filaments, and the more minute or tenuated the nerve the more acute and lancinating the pain.

I come now to speak of the pulp proper. The pulp is generally regarded as a nerve simply enveloped on a membrane, together with artery and veins. I have specimens prepared, showing distinctly that the pulp proper is made up of the ingathering of all the nerve filaments that occupy the tubuli passing down through the membranes, from all sides of the nerve cavity, toward the apex of the fang. This pulp contains many thousands of nerve fibres, all converging as they pass down, coming in close proximity after entering the pulp membrane. Now let us reverse the nerve, or commence at the apicial extremity and pass up the fang in our description. This insignificant nerve, as I have stated, after entering the foramen dentine, undergoes or becomes a system of furcations, sending off branches, as before stated, every five-thousandth of an inch, on all sides, throughout the entire interior of the pulp cavity; hence this small nerve multiplies itself into many thousands of nerves, by a system of branching or bifurcations, sufficient to ramify throughout the entire tooth, continuing to branch after entering the dentine, as has been heretofore described. This pulp might be with propriety denominated fasciculi dentinalis.

The filaments contained in the pulp continue about the same size after entering the dentine on to the first fork. The pulp does not fill the pulp cavity entirely, there being a small but perceptible space between the piamatal membrane and the dura mater dentales, which can be readily seen, after opening the nerve cavity (when the pulp envelope is not wounded), with an ordinary magnifier, and with a microscope viewed as an opaque object, the nerves can be distinctly seen passing the pulp membrane into the dentine. I shall speak of this space more elaborately farther on.

The nerve or nerves contained within the pulp is a multiform arrangement or system, occupying the centre of the pulp membrane throughout, sending off branches on all sides from the central stem obliquely though irregularly outward and upward from the apex throughout, until near the pulp membrane, where they turn nearly at right angles as they pass through this membrane into the dentine. The direction through the latter has been minutely described.

This nerve, in its filamental arrangement through the interior of the pulp, does not observe the same regularity as through the dentine. On the contrary, there is great irregularity; at some points they are very tortuous, full of irregular crooks, observing no regular order except in the

central region. Their directions are outward, but observe no regularity until near the membrane, where their distances apart become nearly equal.

In some regions the nerve branches are crowded or huddled together; in other regions they are wide apart and scattering. There is a great difference in size; some branches are twice as large as others. The above irregularities are more conspicuous in ossified pulps. Some of these nerves have numerous fine, lateral, short branches terminating in delicate points, presenting a feathery appearance. Some branches are formed at their origin of numerous fine branches, soon uniting to form a single branch. These branches, throughout the pulp, are in inverse order to those of the dentine, in this respect resembling the roots and branches of a tree, the roots being situated in the pulp. Some of the pulp branches are larger than any of the dentinal branches, though the larger portion are smaller until near the membrane, where they are all nearly of a size, resulting from the ingathering of minute roots, making up the branches, some of the larger ones fork, just before reaching the membrane, but not frequently. The beaded appearance is observed in the pulp branches as in the dentinal. The central stem resembles a horse's tail (cauda equina) more than anything else. This caudated structure might be considered as one great plexus, containing more nerve branches than any nerve in the whole system; their numbers are legions. Genuine ganglia do not exist in this caudated stem, though there are knots of filaments resembling ganglia. Besides this great central plexus, there are numerous small plexuses where numerous filaments have their origin. These plexuses are all connected with the central system, not isolated. To recapitulate. The central system observes considerable regularity; between this and the dentine great irregularity. Again, near the membrane regularity, as to size and distance apart, predominates. In short, no description by myself can convey any adequate idea of the actual microscopic appearances of this system of complex nerves. It is a complete system of complications within itself, having no analogue in the organism, and when fired up by inflammation is like a legion of infuriated demons, cutting and slashing through the whole body without mercy, which any one having suffered from toothache can fully testify to.

There is besides the nerves, an extensive cellular structure occupying the interfilamental spaces. These cells are filled with colorless globules not half the size of those of blood, together with albumen, soluble fibrin, serum, and bone salts, constituting all the elements of dentinal nutrition.

There is entering the pulp at least one artery and two veins at the apex. These vessels ramify and multiply extensively throughout the pulp.

(To be continued.)

IRON AND ITS MODIFICATIONS.

BY F. K. CROSBY, D.D.S., LYNN, MASS.

A HASTY *résumé* of the preparation and peculiarities of this invaluable metal may be neither uninteresting nor unprofitable to the dental practitioner; for, though in the routine of the laboratory he may not be so often called upon to exercise his skill in the manipulation of the article as is the case with the general mechanician, still a knowledge of whatever pertains to metallurgy will prove of service, and may at some period be turned to practical account. A *theoretical* understanding even of such arts or processes as apply, however indirectly, to his specialty, should be assiduously cultivated, thus acquiring a familiarity with what may be turned the "*æsthetics* of Mechanical Dentistry."

Premising the ore to have been raised from the mines, the first operation which it undergoes is that of calcining or roasting. The ore, in conjunction with coal, is piled in large heaps or mounds, which are allowed to burn themselves out, the process sometimes occupying several weeks. By this means the volatile constituents, as water and sulphur, are driven off. The calcined ore is next placed in a powerful blast furnace, together with lime or clay as a flux, which, uniting with the earthy matters of the ore, is fused into a glass, allowing the melted globules of iron to fall through it to the bottom of the furnace, and at the same time defending the molten mass from the oxidizing effects of the air. The result of this smelting, as it is termed, is the ordinary *pig iron* of commerce.

Malleable iron is made by remelting the crude or pig iron and casting into a plate, which is again broken up and placed in a furnace without blast, where the iron, as soon as it becomes fluid, is stirred about, and water is thrown upon it. The carbon escapes and takes fire at the surface. The mass becomes granulated and finally stiff, in which condition it is taken out in balls and subjected to blows from a hammer weighing several tons, which expels the liquid matter. It is then formed, by means of hammers and rollers, into bars, which are cut, reheated, and welded together their entire length. The principle of the manufacture of malleable iron is to expel the carbon, and at the same time to change the crystalline structure into the fibrous, each particle, by the action of the hammer and rollers, being drawn out, rendering the iron capable of being bent without fracture.

Chilled iron is simply iron cast in iron moulds and exposed to the air as soon as sufficiently set to admit of its being turned out with safety. The surface, from the sudden cooling, becomes extremely hard, but the effect is superficial, as is seen by the line of demarkation presented when the article is broken.

Case hardened iron is wrought or cast iron, which has been enveloped

in carbonaceous materials, as scraps of hoofs, bones, and leather, and subjected to the action of heat for several hours. The exterior becomes hardened and assumes a mottled or marbled appearance such as is observed upon gun-locks.

Steel is manufactured by arranging bars of pure malleable iron in alternate layers with charcoal dust, excluding the air and applying the heat from below. In about seven days the bars have absorbed sufficient carbon to increase their weight the one-hundred and fiftieth part, and exhibit, upon fracture, the crystalline appearance. The exterior is covered with scales or blisters, and the steel, when left in this condition, is known as *blistered steel.*

Shear steel is produced by welding together several rods of blistered steel into a single bar, by means of the heavy hammer. This substitutes the fibrous structure for the crystalline and imparts elasticity to the material, adapting it to the construction of springs. The name is derived from the fact of its having been extensively used in the manufacture of shears for cloth mills.

Cast steel is made by melting fragments of blistered steel and casting into moulds, either in bars or in the form of sheets. It is then subjected to blows from the heavy forging hammer, the blows increasing in power as the steel becomes more fibrous. When thoroughly condensed by this means, it serves a better purpose than any other preparation of iron for the construction of cutting tools or other implements requiring hardness and uniformity of structure.

AMALGAM FILLINGS.

BY R. C. MOWBRAY, WARSAW, ILL.

A CASE of much interest has recently attracted my attention. Miss J., aged 15, has suffered for the past seven or eight years from inflamed eyes. The eyelid is the part affected. About three years since a dentist filled three of her first molars; the cavities were not large or sensitive, and so far as I can learn, gave no pain at the time they were filled, or afterward. The teeth were filled with amalgam, but to all appearance the fillings were doing good service, and preserving the teeth.

About a year after the performance of the operations, the lady was taken to an oculist of St. Louis, *who ordered the teeth to be extracted!* The order was imperative—"they *must* come out," he exclaimed; "who filled them?" etc. (I fancy I see him, indignant and conceited; perchance he knows less about the teeth than dentists generally do about the eyes) The teeth were extracted, and the patient was carefully examined daily, but no good was accomplished; the disease was neither palliated nor cured; she suffers as much as ever from her eyes, and has the remorse

of knowing that she has lost three of her best teeth for nothing. I would minutely describe the condition of her system, and her eyes, but it is not necessary, to bring to your attention the point I desire, viz., what relation exists between the teeth and the eye? Do not the cilliary nerves trace their origin to the ophthalmic ganglion, and back to the Gasserian ganglion, from which all the teeth receive their nerves? So the nerves of the teeth are intimate with those of the eye, and the relation is direct from the ganglion of Gasser to the eyelids, as well as to the incisors. But how can a filling affect the eyes? We believe it a fact that capillary tubes or tubuli exist, and that "they commence at the nerve cavity, with open mouths, and radiating outwardly, never losing themselves, or ending until they terminate in the intergranular spaces, or pass into the enamel." The tubuli or their contents doubtlessly convey sensation to the nerve, and notify it of the presence of foreign and destructive matter in the tooth, as well as to supply every part of the tissue with nutrition. This being the case, when I fill a tooth with amalgam, what effect does it have upon the nerve or nerves? That *some* mercury must remain in the filling, it seems to me no intelligent person will deny; for if the amalgam loses *all* the mercury, is it a filling, or pieces of a filling? We grant that in a properly condensed filling *some* mercury must remain. But here are capillary tubes—thousands of them in a single tooth—all standing as "watchmen upon the walls," and pointing to their great centre, the dental pulp. Even the smallest cavities have a large number of these minute communicators.

Mercury will readily pass through the finest silk. Why will it not as quickly pass through these tubuli when pressure is used to force the filling into every inequality of the cavity? And if it does pass into, and through these tubes, how does it affect the pulp? If the third decimal preparation of mercurius vivus is a valuable remedy for periostitis, pericementitis, etc., why is mercury so *very* injurious, used as it is in amalgam filling? If the one is so excellent to subdue inflammation, why not the other? In conclusion, I would say I offer no defense for amalgam fillings; but the case I have laid before you attracted my attention. I neither filled nor extracted the teeth. The former, as it was, I do not commend, and the latter decidedly condemn as unbecoming the *literati* of any profession, either dental or medical.

COAL OIL IN THE LABORATORY.

BY JAS. A. PRICE, WESTON, MO.

All dental operators, working in the laboratory, have doubtless been more or less annoyed by acids, smuts, etc., unavoidably deposited on their hands in handling the vulcanizer, especially so in opening and handling the flasks after vulcanizing. I have tried many remedies, but all

failed to have the desired effect, until about eight or ten months since I tried the experiment of applying coal oil, and found it a ready agent to remove all stains, smuts, etc. In using the coal oil for this purpose, I take a small quantity in my hand, rub the parts stained thoroughly about fifteen seconds; then apply water, Castile soap, and a nail-brush. All stains, smuts, etc. are thus easily and quickly removed, and the hands left white, smooth, and soft.

Coal oil will also (if applied as above) remove all stains or grease from machinery, and from handling iron, etc.

PROCEEDINGS OF DENTAL SOCIETIES.

TRANSACTIONS OF THE AMERICAN DENTAL ASSOCIATION.

BY GEO. WATT, D.D.S.

The seventh annual meeting of the American Dental Association began its sessions in Hopkins' Music Hall, Cincinnati, Ohio, July 30th, 1867, at 10 o'clock A.M. The President, Dr. C. P. Fitch, of New York, was in the chair, and called the meeting to order; remarking that he was very much pleased to see so many of the members present, and so promptly present. He hoped that many more would yet arrive to take part in the deliberations, and that this meeting would be characterized by harmony and brotherly feeling, and result in greatly promoting the elevation of our profession.

Rev. H. D. Moore, of Cincinnati, then led in prayer, earnestly asking the blessing of God on the prospective labors of the Association, and on all its members.

Professor James Taylor, of Cincinnati, in behalf of the various local societies of the West, delivered a cordial address of welcome, as follows:

Mr. President and Gentlemen of the American Dental Association,—The very pleasant duty of welcoming you to the Queen City of the West has been assigned to me. We congregate in the same hall in which the American Medical Association so recently held their deliberations.

It is a matter of no surprise to us, and yet of some congratulation, that the subject of medical specialties has assumed with this conservative body some importance. It depends very much on the dentist, the oculist, and the *specialty* of general operative surgery, what shall be the status and true progress of medical science in the United States.

In looking back over the rapid progress of dental science for the last thirty years, we feel assured that there is no danger of our being absorbed by the mother of us all, but that the great law of nature will hold good here as well as elsewhere, and that youth, with a good germ of life, will soon outgrow or at least overtake maturity.

In looking over the curriculum of our dental colleges, we are rather disposed to think we shall soon absorb or lay under contribution every

department of medical science. We love, venerate, and cherish the time-honored profession of medicine. It has embraced, for ages, a vast array of talent. The learned, the great, and good are, from year to year, adding fresh lustre to her renown. A more noble, self-sacrificing class of men can nowhere be found, and the more we emulate these noble qualities, and the more of her true science we obtain, the higher we shall place the standard of our specialty.

Mr. President and gentlemen, allow me to revert to the past twenty-five years. We claimed for this city some sixty thousand inhabitants, and little over thirty years since and this great Western Valley could claim only a half dozen or little more dental practitioners. Let me name a Ratre, a Somerby, a Putnam, a Parmly, a Ward, a Hale, and a Rogers. A little over twenty years since and a few of us here, in this city, met together and organized the now oldest dental association, perhaps, in the world, a still young and progressive society. I know not, Mr. President, but that I may have been selected on this occasion, because I am considered one of the links connecting the present with the past, one of the pioneers of this Western development, not quite yet fossilized. Let this be as it may, we still urge on the car of dental science, rejoicing at every new advance obtained.

What a change, Mr. President, twenty years have wrought! When I look around upon this assemblage and see delegates from associations scattered all over our great country; when State, city, and county associations are sending up delegates by the hundred, and four or five colleges are represented, I try to make myself believe that I am growing old; but this is not the case, for others around me, who are my seniors, look young, and I know it is not so much age as vigorous development which has done all this. We are not old, Mr. President. We are yet being developed.

This Association is an organ of our professional body, whose function is the development of dental science. Let us nourish it with so rich a diet that the eliminating organs shall rear a structure enduring as time, built on the solid foundations of immutable truth.

Having this hope, and looking to this end, we now, in behalf of the Mississippi Valley Association, the Ohio Dental College Association, the Cincinnati Association, and such other societies as rejoice in your presence, bid you a hearty and cordial welcome.

We would, Mr. President, through you, extend the right hand of fellowship to all who rejoice in the prosperity of our profession, and who may visit our city on this occasion.

The address was received with hearty applause, and referred to the Committee on Publication.

The Committee of Arrangements presented a report giving a daily programme for business, and also the names of delegates whose credentials had already been presented and found to be regular. The daily programme was as follows:

Clinics, 8 to 9 a.m.

Morning Session, 9 to 12½ p.m.

Report of Committee on Appliances, 9 to 9½ a.m.

Afternoon Session, 2½ to ———.

Evening Session, 8 to 10 p.m.

The names of the delegates will appear in the list of members present.

Dr. Chesebrough moved that the report be accepted and adopted.

Dr. Kennicott objected to the reception of a delegate from the St. Louis Dental College, as there was, in fact, no such institution, however it might have a legal charter, which could be obtained by anybody at a trifling expense. As it had never given lectures, or conducted examinations, but had conferred a number of degrees on parties who had never matriculated or attended lectures in any college, he moved that the case of its delegate be referred to a committee of five, which was carried, and Drs. J. A. Kennicott, A. W. French, J. Richardson, B. T. Spelman, and R. W. Varney were appointed the committee.

A dispatch was received from Dr. W. H. Goddard, of Louisville, stating that their boat was hard aground twenty miles below, with about twenty delegates on board.

The minutes of last year were read and approved. A short recess was taken, to allow the payment of the annual dues, and that new delegates might sign the constitution.

The chair announced the following members as the Nominating Committee: Drs. H. R. Smith, Ohio; J. F. Flagg, Pa.; J. Richardson, Ind.; J. C. Ross, Tenn.; T. L. Buckingham, Pa.; D. S. Dickerman, Mass.; B. T. Spelman, Ohio; A. W. French, Ill.; H. E. Peebles, Mo.

On montion, adjourned to 2½ P.M.

FIRST DAY.—*Afternoon Session.*

Met at 2½ P. M., the President in the chair. The minutes of the morning session were read and approved. The Committee of Arrangements reported a number of additional delegates with regular credentials, who proceeded to subscribe to the constitution and pay their dues. The roll of members present is as follows:

Illinois.—M. S. Dean, S. P. Noble, J. N. Crouse, Wm. Albaugh, R. Gibson, G. V. Black, A. W. French, W. W. Allport, J. A. Kennicott, E. H. Kilbourne, G. W. Field, A. W. Freeman, Geo. P. Kingsley, J. S. Clapp, S. L. Edwards.

Indiana.—Evan Snyder, H. H. Morrison, S. M. Cummings, J. Richardson, E. M. Morrison, A. S. Keightly, J. F. Johnston, J. P. Ulrey, W. C. Stanley, W. F. Morrill, D. M. Weld, P. G. C. Hunt, J. K. Jameson, S. M. Goode, J. Knapp, J. W. Keely.

Iowa.—H. S. Chase.

Kentucky.—A. S. Talbert, W. H. Goddard, B. M. Gildea, Francis Peabody, W. H. Shadoan, H. McCullum, J. A. McClelland, Stoddard Driggs.

Louisiana.—J. R. Walker.

Maryland.—F. J. S. Gorgas.

Massachusetts.—D. S. Dickerman, Jas. Utley, A. Lawrence, L. D. Shepard, I. A. Salmon, W. H. Noyes, O. C. White.

Michigan.—Geo. L. Field, B. Bannister, E. S. Holmes, J. A. Harris.

Mississippi.—S. P. Cutler.

Missouri.—G. A. Bowman, H. Judd, A. D. Sloan, Isaac Comstock, G. W. Tindall, H. J. McKellops, C. W. Spalding, W. H. Eames, W. N. Morrison, H. E. Peebles.

New Jersey.—C. S. Stockton, J. C. Robbins.

New York.—R. V. Varney, W. H. Atkinson, John Allen, E. A. Bogue, C. P. Fitch, Ed. Northrop, G. B. Snow; S. C. Barnum, E. D. Fuller.

Ohio.—F. S. Whitslar, T. F. Davenport, S. D. Stewart, M. A. Spencer, W. M. Herriott, C. R. Butler, R. Corson, C. Palmer, J. H. Paine, D. R. Jennings, M. Rogers, A. E. Lyman, G. Watt, F. H. Rehwinkle, James Taylor, J. G. Cameron, C. M. Wright, Will. Taft, E. Chidester, J. Chesebrough, W. P. Horton, A. Berry, C. H. Harroun, H. Newington, J. B. Beauman, H. A. Smith, B. F. Rosson, R. A. Mollyneaux, H. R. Smith, G. L. Paine, W. G. Drake, G. W. Keely, J. Taft, W. E. Dunn, N. W. Williams, B. T. Spelman.

Pennsylvania.—A. B. Robbins, W. K. Lineaweaver, G. T. Barker, T. L. Buckingham, J. G. Templeton, M. Chapin, G. B. McDonnell, C. Sill, J. F. Flagg, W. E. Magill, D. C. Dunn, Wm. Smedley, H. J. Chandler, A. M. Whitslar.

Tennessee.—J. C. Ross, W. H. Morgan, F. W. Garkey, W. T. Arrington, S. J. Cobb, H. M. Acree, G. W. Acree, J. B. Wasson, R. Russell.

The noise on the streets being so great as to disturb the deliberations, it was, on motion of Dr. Johnston, agreed to meet in the Ohio Dental College for the evening session, the Committee of Arrangements announcing that a more quiet hall would be obtained for to-morrow.

Dr. Magill moved that a committee of five be appointed to report on the present status of the profession in relation to the Goodyear Dental Vulcanite Company. He regarded this as an interesting subject, and one much in the dark. He hoped it would be well ventilated by this meeting.

The President hoped, as last year's action had been misunderstood, and as we had no power to legislate, that the subject would not be introduced. Light could be obtained by proper effort, without diverting the Association from more important business.

Dr. Rogers, of Cincinnati, was surprised at the views of the President, and surprised at the action of the Association last year.

On motion of Dr. Gibson, the motion was laid on the table.

Dr. Lawrence offered the following resolution, which was carried by a hearty vote:

Resolved, That this Association does hereby reconsider its action at our last meeting in regard to the Vulcanite Company, and totally ignore the whole subject.

On motion of Dr. Watt, it was resolved that members of the medical, dental, and ministerial professions of the city, and those who may be sojourning here, be invited to meet with us in our deliberations.

The Nominating Committee reported candidates for officers as follows:

President—H. J. McKellops, A. Lawrence.

First Vice-President—P. G. C. Hunt, G. T. Barker.

Second Vice-President—A. S. Talbert, A. B. Robbins.

Corresponding Secretary—C. R. Butler, W. T. Arrington.

Recording Secretary—J. Taft, J. A. Kennicott.

Treasurer—W. H. Goddard, James Taylor. Dr. Taylor declined.

The result of the ballot gave for—

President—A. LAWRENCE, Lowell, Mass.

First Vice-President—P. G. C. HUNT, Indianapolis, Ind.

Second Vice-President—A. S. TALBERT, Lexington, Ky.

Corresponding Secretary—C. R. BUTLER, Cleveland, O.

Recording Secretary—J. TAFT, Cincinnati, O.

Treasurer—W. H. GODDARD, Louisville, Ky.

The President appointed Drs. Spalding and McKellops to conduct the President elect to the chair. On being introduced by a few elegant and appropriate remarks by the committee, the President elect made a brief and eloquent extempore address, of which the following is but a defective synopsis:

GENTLEMEN OF THE ASSOCIATION,—In assuming a position so important, and at the same time so unexpected, I would be untrue to myself not to give some expression of thanks for the honor conferred. And while I regret that one of more executive talent, and more experience, has not been elected, I promise to discharge the duties of the office to the best of my ability, in all fairness and candor, and without regard to persons or circumstances. Relying on your concurrence, and believing that I shall have your support, and the efficient aid and assistance of those elected by you to co-operate with me, I hope to discharge the duties you have called me to in such a way as will promote the great end for which we are assembled.

The retiring President read a carefully written address, which was referred to the Publication Committee.

Adjourned to meet at the Dental College at 8 P.M.

FIRST DAY.—*Evening Session.*

Met according to adjournment.

On motion of Dr. Watt, a vote of thanks was tendered to the retiring officers.

Dr. Shepard, Chairman of the Publication Committee, requested an opportunity to make a statement. He stated that the transactions were not yet complete, but would probably be ready for delivery in four or five weeks. The delay had been caused in part by the sickness of the chairman, but mainly by the delay of authors in not promptly returning proof sheets.

The President called for the reports of standing committees. That on

Pathology and Surgery being first in order, Dr. Atkinson stated that till very recently, he did not know that he was chairman of the committee, and consequently he had no report.

The Committee on Operative Dentistry being called, Dr. Butler asked time, as the chairman was not present. Granted.

The Committee on Mechanical Dentistry asked further time through Dr. C. Palmer, which was granted.

The Committee on Dental Education asked till to-morrow morning. The report was ready, but they had not expected to be called on this evening, as so many preceded them on the list.

The order was suspended to hear the report of the Treasurer, which was read and referred to an auditing committee, consisting of Drs. Chesebrough, Peebles, and Kilbourne.

The Committee on Dental Literature had no report.

The Committee on Prize Essays had no report, and asked for time.

The Committee on Physiology had two papers, but asked for time to revise and compare them, which was granted.

Dr. John Allen, Chairman of the Committee on Volunteer Essays, stated that he had a paper on "The Physiological Characteristics of various Nations, with special reference to the Teeth."

The Committee on Dental Chemistry reported through Dr. Lawrence, in the shape of an eloquent, lively paper, the reading of which broke the monotony of the evening, interfering, as the President said apologetically, with the "no-report" rule, which seemed to have been adopted by almost universal consent. He said chemistry might be called the right hand of the Creator. He regarded electricity, light, heat, etc. as but varied manifestations of unitary force. All sciences might be regarded as but scintillations of this one. That our profession was far too ignorant of this science, he regarded as true; but he was not ready to admit that we have scarcely one per cent. of good chemists among us. He believed the medical profession to be as defective on this science as the dental.

He alluded to the violations of chemical laws in the preparation of food, especially in the article of bread. The bone-making portions of the grain being removed in preparing the fine, superfine, and double refined flour, the result is:

> We eat the unhealthy "superfine,"
> And feed the *best* to filthy swine.

This, he thought, we could not afford, in view of the claim to superiority we set up against the hog. He thought it was evident that the teeth of the race are to be improved mainly by improving the diet, and this would require a general diffusion of a knowledge of this science, but it was sadly neglected as an element even of a liberal education.

The report was accepted and referred to the Publication Committee.

Dr. Buckingham indorsed all that the paper contained. Not one in

ten of the profession understand the composition of the human body, and, of course, know but little as to how it is to be nourished properly. The science of chemistry is neglected in our schools, even in our high schools and colleges, while a knowledge of it is necessary to the faithful discharge of the duties of every department in life. As an illustration, no one needs it more than the cook. While it is the science by which mysteries are solved and explained throughout the physical world, it is regarded by all as a dry study, and is therefore almost ignored.

Dr. Kennicott said if an amendment to the report was admissible at this stage, he would like to have added to it, "as a codicil," Dr. S. S. White's remarks on sunshine as a hygienic agent, made at the last meeting of the Mississippi Valley Association, and published in the *Dental Register.*

Dr. White being repeatedly called for, stated that he understood too well what a compliment was thus offered not to rise, but he was not ready to say anything at present.

Dr. Watt said he felt like opposing somebody or something, and as a little antagonism was often necessary to insure earnestness, he believed he would take issue with the statement that chemistry is regarded by all as a dry study. He saw before him the countenances of several brethren who did not so find it. He never had cause to complain of his classes neglecting this study on account of its dryness, or for any other cause. He had always found his classes as willing to study chemistry as operative or mechanical dentistry. And he believed it would be impossible for any one, even a mule, to regard chemistry as dry, after he understood the laws of affinity, and the doctrine of chemical equivalents. He regarded this as having a wider range than any other science, and as more important than any other.

Dr. Barker said we must not forget that there are other sciences besides chemistry. That the evils of defective or perverted nutrition may be overcome, we must know when to eat, what to eat, and how to eat.

Dr. Atkinson said all other sciences are as important as chemistry. "Chemistry is simply togetherness." He asked what are the unitary conditions of a body, and answered, centre, surface, and matter. He referred to the body, soul, and spirit, and said that, of the three, the latter is most interior, and, even when considering the most material, we are grappling with "the things around the throne." He would enter his caveat against the exaltation of this science above all our other knowledge, and remind those taking such positions that science is far short of inspiration.

Dr. Spalding said that we view this science, as we do other things, from different stand-points. He regarded different views as necessary to the advancement of our best interests, and that is why we gain so much by coming together. He spoke of three kingdoms in nature—the mineral, vegetable, and animal; and he claimed that chemistry proper—chemical

force as such—pertains mainly to the first mentioned. In the other kingdoms, other principles govern; but it should be borne in mind that all these forces are correlative. One may be changed into another; but after the *change*, it is not the same. For example, if chemical force is changed into electricity, it is no longer chemical force; and when light is changed into heat, it is no longer light. A simple and familiar experiment may illustrate and demonstrate this change: If pieces of cloth, of similar texture and thickness, but differing in color, be laid on the surface of snow exposed to sunshine, the snow will melt more rapidly under the black than under the white cloth, though it is evident that equal quantities of light and heat fall on equal surfaces of both. The different results are to be explained on the principle that a portion of the light falling on the black cloth is changed into heat. He did not regard nerve force as an exception to the law of correlation.

Dr. Fitch said these things are interesting mainly because we do not understand them. He regarded the mineral kingdom as the proper field for the manifestation of chemical force. In this the experiments are highly interesting; but of the laws of combination, we know absolutely nothing. The most interesting department of this science is vital chemistry. He would like to have the data or law governing the action of the stomach.

Dr. Walker alluded to the want of ventilation in the hall as a violation of chemical laws.

Dr. Rogers was struck with the remark, in the report, that we give the best of our chief article of food to the pigs. The food of the mother, during the periods of gestation and nursing, he regarded as very important, and believed the matter was too little thought of. He referred to horizontal lines, or grooves, on teeth, as sometimes found, and regarded them as evidences of defective nutrition during the formative periods of the teeth.

The hour of adjournment having arrived, the chair announced as clinical operators for to-morrow morning, Drs. I. A. Salmon, of Boston; S. Driggs, Lexington; W. T. Arrington, Memphis; C. R. Butler, Cleveland; J. F. Flagg, Philadelphia.

Adjourned till 9 A.M. to-morrow.

SECOND DAY.—*Morning Session.*

Met at 9. President in the chair. The minutes of the afternoon and evening sessions of yesterday were read and approved.

Dr. Taft, of the Committee of Arrangements, reported that Mozart Hall could be obtained for the remaining sessions of this meeting. It was, on motion, agreed that when we adjourn, it be to meet in Mozart Hall.

Dr. Wetherbee moved that an assessment of two dollars, in addition to the annual dues, be levied.

Dr. Buckingham opposed, till an estimate of the amount needed could be obtained.

Dr. Shepard moved to amend by making the assessment three dollars. The amendment was accepted.

Dr. Watt moved that this whole matter be referred to a special committee of three, with instructions to report to-morrow morning. This was carried, and the chair appointed Drs. Dean, Wetherbee, and Morgan.

A special committee of five, consisting of Drs. Allen, Peebles, Chase, Dickerman, and Morgan, was appointed to consider and report on the disposition of the proceedings of the present meeting.

The Nominating Committee, on motion of Dr. Watt, was instructed to nominate, with the standing committees, a special committee of three on Dental Therapeutics.

A proposed amendment to the Constitution, of which Dr. Spelman gave notice last year, was taken up. The amendment proposed was, in substance, this: "To be entitled to representation by delegates in this Association, dental societies must adopt or substantially recognize its code of ethics."

By request, the code of ethics was read by the Secretary.

Dr. Flagg opposed the adoption of the amendment. He had never read the code of ethics to which it refers, and did not know till a day or two ago that this Association had adopted such a document.

A number of speeches followed, Drs. Berry, Bogue, Watt, Spelman, and Allport favoring, and Drs. Barker and Fitch opposing the amendment, the latter gentleman denying the right of the Association to define the conditions of its membership, claiming that this power was vested in the local societies.

The subject was laid on the table.

Dr. Watt gave notice that the same amendment, in the same words, would be proposed for adoption at the next annual meeting.

The Special Committee on Finance reported the present liabilities of the Association to be $460, and that an additional assessment of three dollars on each member would meet the present demand, and leave $110 in the treasury. After some discussion on the motion to accept and adopt the report, it was laid on the table till after the report of the special committee on the disposition of the proceedings of this meeting.

Dr. Taft, Chairman of the Committee of Arrangements, stated that since the complaints about the noise here, and the engagement of Mozart Hall, he had learned that Mr. Hopkins charges nothing for the use of the Hall thus far, and had intended to donate the use of it for the whole time. A hearty and unanimous vote of thanks was tendered to Mr. Hopkins for his liberality.

Adjourned to meet in Mozart Hall at $2\frac{1}{2}$ P.M.

Second Day.—*Afternoon Session.*

Met at $2\frac{1}{2}$. President in the chair.

The report of the special committee on the disposal of the proceedings stated that the committee had conferred with the proprietors of the *Dental Register* and Dental Cosmos, and those gentlemen had generously offered to publish all the discussions and written papers presented to the Association, in their respective journals, free of charge, and they recommended that the offer be accepted.

On the motion to adopt the report, Dr. Spalding said he was opposed to going backward; he was decidedly in favor of continuing the publication of the proceedings in separate volumes.

Dr. Taft coincided with the views of Dr. Spalding. The recommendation to publish the transactions of this body in the fugitive pages of monthly journals, was certainly not the best way to preserve them for future reference. If no better way was proposed, he would be willing to publish the transactions in a separate volume, at his own expense, and depend on the sale of them for his compensation.

Dr. Wetherbee thought if the transactions were worthy of publication at all, they were worth publishing in their proper form.

Dr. Watt alluded to the fact that at the second meeting of the Association, owing to the distractions caused by the war, but a very few members were present. These few met the crisis with a courage worthy of the cause, and saved the life of the Association. They resolved to publish the transactions in a separate volume, to have it secured by copyright, and to restrict its sale to members of dental societies. This resulted in the rapid formation of local societies, and the result was a large meeting the next year. If the few members at that meeting could take such responsibility, he thought the Association, now so strong in numbers, could well afford to publish its own proceedings, especially when there was no longer a necessity for restricting the sale of them. And, besides, the journals would be as well filled without these transactions as with them.

The report was finally recommitted.

Dr. Kennicott, Chairman of the Committee on the Credentials of the delegate from the St. Louis Dental College reported as follows:

Your committee would respectfully report that they have had the matter referred to them carefully and earnestly under advisement, and weighing carefully all evidence, *pro* and *con.*, they are forced to the conclusion that the St. Louis Dental College has no existence except under a technicality of a loose and dangerous statute of the State of Missouri: that it has never attempted to fulfill the spirit even of this bad law, by instituting lectures, clinics, or any other mode of teaching dental science; that the degrees and diplomas which this so-called college has conferred are null and void in law, and ought to be ignored and repudiated by all regularly constituted colleges and associations; that the scheme of its birth was conceived with very discreditable motives, and that its culmi-

nating act of sending delegates to this Association merits our strongest condemnation and rebuke.

And finally, your committee believe that the recognition of this so-called dental college by this Association, by accepting its delegates, would be setting a dangerous and mischievous precedent that would lower the standard of dental education and put quacks and mountebanks in the highest places of trust and honor in the profession.

All of which your committee most respectfully beg leave to submit for the consideration of this Association.

J. A. Kennicott,
A. W. French,
J. Richardson,
B. T. Spelman,
R. W. Varney,
Committee.

The report was accepted and adopted by a unanimous vote.

Dr. Kennicott offered the following resolution:

Whereas, It is a cherished object of this Association to elevate the standard of dental education, and wipe out from the escutcheons of our noble profession the stains of quackery; therefore

Resolved, That we will not countenance any act of any dental college that shortens the road to the honorable title of Doctor of Dental Surgery, by lowering the standard of professional excellence.

It was adopted unanimously.

Dr. Allen, from the committee on the disposition of this year's transactions, reported that the committee had a communication from Dr. Taft, stating that, if it was so desired, he would publish the proceedings of this meeting on his own pecuniary responsibility, and depend on the sale of the volume for his remuneration.

The committee recommended the acceptance of Dr. Taft's offer. The adoption of the report was opposed by Drs. Spalding and Berry, and favored by Dr. Allen; and finally the subject was laid on the table.

The constitutional amendment, changing the annual dues from $2 to $5, was adopted.

The regular order of business was resumed, the Chair announcing the report of the Standing Committee on Dental Chemistry as now before the meeting.

Dr. Watt said there appeared to be a want of clearness of idea on the part of some as to what chemistry is. He alluded to the fact that several members had proposed to name something more important than chemistry, and, in endeavoring to do so, had set forth an array of chemical statements or questions. For example, we had been told that the questions "what to eat, when to eat, and how to eat" were more important than any chemical questions, when, in truth, these are strictly chemical, no other science being at all able to answer them. Nothing, he thought, could be much better recognized than the fact that our bodies are built up and nourished in strict obedience to chemical law. Again,

it had been suggested—or nearly so—that chemistry proper is restricted to the inorganic Kingdom of Nature; that when matter is organized it is governed by vital, and not chemical force—that the latter is changed to the former, on the principle of correlation; but such position does not appear to be tenable. Chemistry is by no means so restricted. All the matter in the universe is governed by its laws, which are uniform in their action, under perfect similarity of circumstances. In the inorganic kingdom, chemical action is modified by a variety of circumstances, such as cohesion, volatility, electric action, etc.; and when brought from this to the organic kingdom, it meets with vitality or vital force, as another modifier; yet, all the time, this force, sometimes called affinity, is true to its own nature, obeying the laws by which it is governed under whatever circumstances may be present. The only knowledge having a wider range than this science is *omniscience.* It is true that *chemical action* is restricted by the boundaries of matter; but *chemical science* is not so bounded; it goes away beyond, to the utmost limits of space, to inquire if there is *matter* there; and only it and omniscience are able to answer the question.

Dr. Barker stated that two children might be fed at the same table, on the same kinds of food, in equal quantities, and yet the one may be fat and healthy, while the other is lean and languishing. The chemical materials of the food are the same in the two cases, while the results are widely different.

Dr. Spalding claimed that the chemical is the governing force in the inorganic kingdom; but that matter belonging to the vegetable and animal kingdoms is controlled by a superior force—the *vital,* and in the animal, the *nerve* force; and he did not regard the latter as an exception to the law of correlation, but though it may once have been chemical force, it is a higher grade of force now. He thought chemical force, as manifested in the mineral kingdom, had no place here, but had given place to a higher manifestation of force.

Dr. Watt stated that a proof that chemical force acts, *as such,* in the organic kingdom, is afforded by the fact of definite combination. The law of chemical equivalents is the fundamental principle of chemical science; and this, he said, was manifested in both the vegetable and animal portions of the organic kingdom. He illustrated this by the combination of albumen with nitrate of silver. He said the proportions were the same, whether the albumen came from the vegetable or animal kingdom, and the same whether it was living or dead.

Dr. Atkinson asked, What do you mean by dead albumen?

Dr. Watt said that when albumen had no organic connection with a living organized body, he regarded it as dead; and, in illustration, he referred to certain morbid conditions of the system, in which albumen is thrown off as excrementitious matter with the urine. Then he regarded

it as dead; but when constituting a portion of the blood or muscle of a living being, he regarded it as alive. He said this might not be a very technical definition; but he did not care, if he was only understood.

Dr. Atkinson responded, "But you must care; we want correct definitions." He said albumen that is dead is not albumen. He illustrated his idea of the essence of life by referring to silex. It is composed of silicon and oxygen—elements which are not alive; but when they combine, the result is a quartz crystal, and that is alive. The great error of the report, and of the preceding remarks, he said, consisted in assuming that a part is greater than the whole. Human life had three distinct departments—conscious life, systemic life, and molecular life. The whole difficulty, he said, had risen from a too high estimate of our own knowledge. He inquired, What is knowledge? and defined it to be "an overpowering perception of the truth." He stated that all things differ but in degree; and that human life includes all of chemistry, as once there was but one human being on this planet, and that one the planet itself. Chemistry is that "togetherness" that crystallizes that which has been broken down, of previous formations, and from their *débris* gives higher organizations; as when the mineral kingdom was half completed, the lower half of the vegetable came, as a correlation of the mineral. Then, when the vegetable kingdom was half complete, the animal came, it being then about ten o'clock on the dial of creation, at the noon of which, a supernal will came. He maintained that there is but one force in the universe, and that segregations of this same force, in minus quantity, constitute all else that is called force. And the conclusion of all is, that centre, surface, and substance include all of existence.

Dr. Chase thought some of the speakers had spoken ambiguously in using the term "mineral" when they meant inorganic. Oxygen, nitrogen, etc., he said, could not with propriety be called minerals, yet they belong to the inorganic kingdom.

Dr. Buckingham stated that chemistry investigates the laws of matter, first in its elements, and then in compounds. By the manifestations of chemical force, we recognize the difference between elements and compounds. He illustrated the subject by the uses of letters. Each letter has its own peculiar character; and, by combining these peculiarities, words are formed. The elementary characteristics of the letters are, for the time, lost in the word. So each atom of matter has a property peculiar to itself; and it never loses this except by combination. We regard oxygen in accordance with and recognize it by its properties; so also of hydrogen; but when they are united, we think not of the elements, but of the liquid water. And the figure is still good. We may read the details of a serious accident, and never think of the letters or separate types used in printing them, but only of the facts detailed. The elements

of matter and chemical force are alike indestructible. Now, chemistry teaches the nature of this force rather than of the matter acted on by it; and this force is always persistent, and chemistry teaches, as well, that matter cannot be changed.

Dr. Spalding thought that this would be clearer by bearing in mind that forces are changed into each other. When affinity is changed to mechanical force, it is no longer affinity.

Dr. Taft would like to ask Dr. Spalding a little about this correlation of forces. He was not clear about the different colored cloths on snow, as referred to last evening. Might it not be that the difference resulted from the different reflecting and absorbing powers of the different colors?

Dr. Spalding was happy to explain. He said we must take the testimony of competent experimenters; and they tell us that the reflection and absorption of heat are not in the least affected by color. The difference in light and heat, he said, was only in the character of the motion. By changing the motion the results are changed.

Dr. Judd said that the position of Dr. Spalding was corroborated by placing the different colored cloths in ice instead of on snow.

Dr. Buckingham claimed that color does affect reflection and absorption. He illustrated his point by an analysis of the solar spectrum, and a reference to red heat, stating that by increased rapidity of motion, heat is changed to light.

Reports of Standing Committees being in order, the Committee on Dental Pathology and Surgery was called for.

Dr. Atkinson stated that he did not know till the 13th of June that he was chairman of this committee, and he had neither the time nor strength to get up a proper report. In accordance with a suggestion of last evening, he had thrown together a few thoughts as a starting-point for discussion, which he would now read. A full, or at least a regular report would have been prepared had the circumstances not been as he had stated.

[The reporter is not able to give a satisfactory synopsis of Dr. A.'s paper, and therefore refers the reader to the official transactions.]

The paper was accepted, and referred to the Committee on Publication.

Dr. Taft hoped this subject would not be lightly passed over. He would much prefer to hear principles discussed, but would listen cheerfully to details of cases; but when principles are clearly laid down, details come easy.

Dr. Judd said he always desired to base theory on fact. Some things in the paper he did not know whether to regard as facts, or merely theories, as, for instance, the statement that the periosteum is not *the* bone producer. We must know how this conclusion has been arrived at before we are ready to give it a place among the established facts of science.

Dr. Atkinson replied that the statement goes back, in his observation and experience, to 1837. He was able to show that each tissue is evolved from specific cells—from cells peculiar to itself. That the periosteum, instead of being the bone maker, only defines or limits the proliferous cells. If there is something besides its own essential tissue connected with the periosteum, the case is different. He could show cases of re-formed bone that would illustrate what is meant by the action of osteoplastic cells. In these osteoplasts the lime salts are deposited. When the periosteum is torn from bone, a number of these osteoplasts are torn off with it, and hence bone is reproduced, in connection with, but not by the periosteum. A complete member (as a lower jaw) is sometimes formed, and sometimes not, in these reproductions. Facts are nothing when principles come along! Facts are but the outcropping of principles. To illustrate the point: if we receive a present of money by express, will we thank the last office, or the sender? The principle is the sender; the fact is simply one of the offices through which the blessing has come.

Now, in the removal of necrosed bone, with the hope of reproduction, some practical points are worthy of careful attention. A watery solution of chloride of zinc, about 20 grains to the ounce, should be injected into the wound. It will stop slight bleeding, and form a colloid mass; and if this mass is large enough to form a pocket for the new formation, no more dressing is needed for that day. As a hint at what may be done in this direction, he stated that he had seen the upper jaw and palatal bones reproduced, and there was nothing in the external appearance of the parts to indicate other than the normal conditions as to form and texture. In the re-formation of alveolar processes, he used to dislike the extremely thickened appearance they presented, but he found they were easily thinned down by pressure.

The hour for adjournment having arrived, the President announced as clinical operators for to-morrow morning, Drs. McClelland, Flagg, C. Palmer, Varney, Salmon, Shadoan, and Harroun.

Adjourned to 8 o'clock P.M.

SECOND DAY.—*Evening Session.*

Met at 8 o'clock, and resumed the consideration of Pathology and Surgery.

Dr. Chase said it was important to keep clearly before the mind the difference between physiology and pathology, though it was difficult in some cases to draw the exact line of distinction. When bone is produced where it is not wanted, the action is regarded as pathological; if where it is wanted, it is called physiological action. Inflammation might be called an excess of vital action. He disagreed with Dr. Atkinson as to the position that bone cannot be produced except when there are pre-

existent osteoplastic cells. Take, for illustration, the egg. The germinal cell there is a simple cell. You do not find a specific osteoplast or bone cell, nor a specific feather cell, but all these tissues are developed from the simple cell. There is a ghost there! He knew what Dr. A. meant by his ghost theory, and he agreed with it—that there is a presiding power, which is capable of producing, from this primary or typical cell, all the varieties known to physiology.

Dr. Watt said he thought mistakes had been made, both by physiologists and pathologists, by giving more deference and respect to the periosteum than it was entitled to. It had been maintained by many that, in order to the reproduction of bone, the periosteum of the lost bone must have been preserved; but this was certainly not necessary in all cases. It would appear strange when Nature can reproduce so many other tissues, that she must fail on the periosteum, which is certainly not a very complex or peculiar tissue. He believed that patients often failed to obtain the best that surgery can give them, on account of this mistaken theory having such a strong hold on the minds of the profession. Feeling thus, and believing that the absence of the periôsteum should not result in the absence or loss of all hope, he had recently performed an operation, which, perhaps, was not warranted by the books.

Three and a half weeks ago, a young man called on him, having lost three of his upper incisors by a blow. The lips and gums were bruised and swollen. The lingual wall of the socket of one of the centrals was broken inward, and quite loose. It was now $7\frac{1}{2}$ P.M., and the teeth had been knocked out at $4\frac{1}{2}$. Then he had only the centrals with him, and they were, to all appearance, perfectly dry. All adherent portions of periosteum were removed from the teeth with a bone knife, so as not to cut or abrade the cementum; the sockets were washed out with tepid water, and the two centrals were reinserted and temporarily retained while he went in search of the lost lateral. He found it, and at $9\frac{1}{2}$ P.M., five hours after it had been knocked out, it was replaced, and a compress of gutta-percha was so adjusted as to hold all three in their proper positions. The compress was worn till 10 o'clock next day, when it was removed for the purpose of taking nourishment, and to cleanse it. It was replaced, and worn most of the time till the next morning, when it was abandoned. The case was closely watched, both local and constitutional treatment being used as indicated, and to-day, as several of the members present can testify, the teeth are adherent and comfortable, one of them being nearly if not quite as firmly attached as ever. The attachment at the lingual surface of the neck of the tooth in the fractured socket is not yet perfect, but the improvement is very rapid even here. The lateral, which was out five hours, is adherent throughout the socket.

A member inquired if the pulps were removed before replacing the teeth, to which Dr. W. answered no.

He was asked if he expected the pulps to re-establish their vital connection with the system. He answered that he had just faith enough in the principle to induce him to give Nature a chance to do her best. He referred to two cases of replanted teeth that came under his observation. One of them was reinserted by Dr. Taft in 1843, a few minutes after extraction. He had opportunity to watch that tooth up to about 1862, at which time it was, to all appearance, a perfect tooth, and by testing with a fine drill, the dentine was found to be normally sensitive. He inserted a similar tooth in 1851, and several years afterward it was natural in color, and apparently all right. He believed that these two teeth had living pulps years after their removal and replacement.

Dr. Allport referred to a case published by him some years ago, entitled "Just to please his mother." A central incisor was knocked out, and fell into a puddle of water. A portion of the socket adhered to it. The boy's father brought the tooth to him in his pocket with his tobacco, the boy accompanying him. The tooth was replaced, and retained in place by a ligature of silver wire. On seeing it three or four days afterward, it appeared somewhat loose, and he wired it again. Seven weeks after the accident an alveolar abscess was developed at the root of the tooth. He drilled into the tooth, and filled the canal successfully. The tooth retained a good color, and the abscess was obliterated. This tooth was out of the mouth about two and a half hours, though in the published report he had said an hour, lest he might be disbelieved.

Dr. John Allen reported a case of a patient, thirteen years old, who had four front teeth knocked out. He washed the teeth, and tied them in place by a silk ligature, and afterward with a gold wire.. They had been out two or three hours, but became reattached to the sockets.

Dr. Acree reported a case of a sound tooth taken out in 1858, and replaced immediately. Last April it appeared to be a perfect tooth.

Dr. Berry referred to a case of a transplanted tooth found in the practice of one of his neighbors (Dr. Allen), which had lasted many years.

Dr. Fuller said that the success of such cases depends very much on the health of the patient. He reported a case of two teeth replanted in the mouth of a patient eighteen or nineteen years old. They did well for eighteen or twenty years, and then gave trouble, and were afterward extracted. He thought this was evidence that they had never had a true vital connection with the system during all those years.

Dr. Herriott reported a case of a young lady who had a second bicuspid removed by accident or mistake. It was promptly replaced, and, at the end of three months, appeared to be all right. This was in 1857. About six months ago he saw that tooth, decayed to the pulp cavity, and the pulp alive. His records of the case assured him that there was no mistake as to the identity of the tooth. (Dr. H. has promised a fuller report of this case for publication.)

Dr. Taft thought that many in our profession failed to give their patients the best that our science affords for want of faith in the recuperative powers of the constitution, and want of confidence in their ability to accomplish what is desirable. This want of faith is often fatal. A man seldom succeeds in that which he regards as impossible, or even impracticable. A majority are incredulous about the capabilities of dental surgery, because not familiar with the vital powers of the system. They do not study the histology and physiology of the human being sufficiently, and are, consequently, as likely to be wrong as right in their treatment of many cases. And want of faith—unbelief—in many cases retards progress more than want of knowledge. The man that believes that he *can*, and is determined that he *will*, seldom fails in any department of dental surgery.

He referred to the case of replanted teeth reported by Dr. Watt. He would not charge the doctor with want of faithfulness in reporting the case, but he would say that he had understated the difficulties. He was at Dr. W.'s when that patient first called. He saw a pale, delicate, cadaverous young man, not yet recovered from a day of dissipation. Dr. W. asked his opinion as to the propriety of replacing the teeth. In view of the dried condition of the teeth, the fractured socket, the bruised mouth, and the defective constitution of the patient, he rather advised against it. I supposed, said he, the doctor had returned to his operating room simply to dismiss the patient. After some time, he came in, stating he had reset these teeth, and sent the patient in search of the other one. Dr. W. had watched the case closely ever since, and he had opportunity to see it occasionally; the progress has been, all the time, satisfactory, and the condition is satisfactory now. Now, he would like to know how many members of this Association would have had sufficient confidence in the recuperative energies of the system to have replaced those teeth. Yet this, he said, was not so marvelous as the restoration of bony tissues lost by syphilitic or other disease; but we have seen constitutions, loathsome and rotten, restored to health and society.

An important element of success in dental surgery, after knowledge and faith, is compatibility between patient and operator. He sometimes found patients that it was a pleasure to work for; and after working hard all day for such patients, he felt stronger than in the morning. Then he found others that he could scarcely operate for at all; and he was now in the habit of declining to work for such. He also found some apparently neutral; he could work for them about the same as if they were wooden men. He regarded it as impracticable to perform first-class operations where this incompatibility existed.

Dr. McDonnell inquired if any had successfully replanted teeth for patients past the prime of life.

Dr. Kilbourne spoke of a case in which a portion of a tooth was re-

cently extracted, which he was told had been replanted when the patient was forty-eight years old. He stated he once extracted two first molars from a lady, removed the pulps, filled them with tinfoil, and replaced them "just for a joke." Six or seven years afterward they were in the mouth, and comfortable.

Dr. Kennicott said such cases as had been detailed this evening had ceased to sound strangely to him. At fifteen years of age his front teeth were all loosened, and the two lower centrals knocked out. There was also a transverse fracture of the lower jaw, and he was unconscious from the injuries sustained. The physician called to the case was ten miles away. At the solicitation of his brother, the teeth wêre replaced. The face became much swollen and very painful. The accident confined him to his bed for two months. The result was good. Thirty years after the accident an abscess formed at the root of one of the replaced teeth. The upper molars were out of the sockets, but hanging by the gums. Years ago these teeth were filled by his brother. The pulps were then exposed and alive, and they are alive yet. He also mentioned a case of successful transplanting. The pulp was dead.

Dr. Black spoke of a case in which four incisors were out, and the cuspids hanging by the gum. They were all replaced, and were doing well several years afterward; and he believed the pulps were alive, as the dentine was normally sensitive.

Dr. Berry stated that a gentleman present claimed to have inserted three sheep-teeth in the place of lost incisors, and the case was doing well, except that there was "a hankering for grass."

It was, on motion, agreed that the place for the next meeting be selected at 10 o'clock to-morrow. And it was further agreed that the paper of Dr. Allen be read immediately afterward. Dr. Barnum was announced as clinic operator for to-morrow morning, in place of Dr. Varney, who had not come prepared with instruments.

Adjourned till 9 A.M. to-morrow.

(To be continued.)

CENTRAL NEW YORK DENTAL ASSOCIATION.

BY CHAS. BARNES, D.D.S., SYRACUSE, N. Y.

THE annual meeting of this Association was held at Syracuse, June 19th, 1867.

The dentists of Oneida County held a meeting at Utica April 25th, for the purpose of forming an association, and passed a resolution to unite with this Society. The names of sixteen persons from that county were presented for membership, who were duly elected.

The officers elected for the ensuing year were:

President—Dr. A. N. Priest.

Vice-President—Dr. George W. Tripp.

Corresponding Secretary—Dr. E. Carpenter.

Recording Secretary—Dr. Chas. H. Forman.

Treasurer—Dr. J. H. Bradt.

The following committees were appointed:

Excutive—Drs. G. B. Wright, S. B. Palmer, and Chas. L. Chandler.

Membership—Drs. J. A. Cowles, S. G. Martin, and J. O. Thomas.

Publication—Drs. P. Harris, L. W. Rogers, and Chas. Barnes.

Dr. P. Harris, the retiring President, read an interesting address, and hoped as soon as the vexed rubber question is settled, the members of the Society would give more attention to the higher branches of our profession, and especially to the preservation of the natural teeth. He suggested the importance of the Society having a room with a good microscope, where specimens might be more thoroughly examined and preserved.

The meeting being of a business nature, no essays were read, and adjourned to meet at Auburn, Sept. 17th next.

POUGHKEEPSIE DENTAL ASSOCIATION.

At a meeting of the dental profession of Poughkeepsie, N. Y., held at the rooms of Drs. Roberts & Houghton, on Friday evening, June 17th, 1867, a local dental society was formed, and the following gentlemen elected officers for the ensuing year:

President—Dr. Jas. H. Mann.

Vice-President—Dr. Chas. L. Houghton.

Recording Secretary—Dr. H. F. Clark.

Treasurer—Dr. J. A. Jillson.

LEHIGH AND DELAWARE VALLEY DENTAL ASSOCIATION.

BY J. D. MILLER, D.D.S.

At Allentown, Pa., twenty-one dentists united in a society to be called the Lehigh and Delaware Valley Dental Association, and completed the organization by electing for the ensuing year, Dr. J. P. Barnes, of Allentown, President; Drs. E. R. Crane, of Belvidere, N. J., and W. E. Buckman, of Easton, Pa., Vice-Presidents; Dr. J. D. Miller, Recording Secretary; Dr. W. C. Detweiler, of Easton, Pa., Corresponding Secretary; Dr. M. E. Martin, of Allentown, Treasurer.

Some very appropriate remarks were addressed to the Association by the President, upon the objects of the Association; first, to generate, diffuse, and foster a social, liberal feeling among dentists of this district, and

to uproot that now too prevalent ignoble selfishness; to make our practice uniform and co-operative, a kind of mutual benefit association, in bringing mind in contact with mind on professional topics.

Next meeting to be held in Belvidere, N. J., Oct. 16th. Subject for general discussion, Anæsthetics. Essayists, W. C. Detweiler and J. D. Miller.

HARRIS DENTAL ASSOCIATION.

BY W. NICHOLS AMER.

THE first stated meeting of the Harris Dental Association of Lancaster, Penna., was held August 12th, 1867, at the office of Dr. Jno. McCalla.

President in the chair.

The minutes of previous meetings were read and approved.

Drs. J. Martin, of Strasburg; B. A. Boyce, of Fairfield; J. G. Moore, of New Holland; and S. Atlee Bockius, of Columbia, were elected to active membership.

At the request of the members, the President repeated an essay on the "Relative Liability of Teeth to Decay," previously read before the Lebanon Valley Dental Association.

Verbal communications of a very interesting character were made by Drs. Welchens, McCalla, and Hiestand.

Dr. Welchens voluteered to read at the next meeting of the Association, an essay on Professional Status.

On motion, adjourned to meet at the office of Dr. Welchens, on the first Thursday in November next.

EDITORIAL.

DENTAL COLLEGES.

THE annual announcements received from the Baltimore, Ohio, Philadelphia, New York, and Missouri Dental Colleges for the next session, 1867–8, indicate in the most unmistakable manner what they are prepared to do for the education of the profession. Changing as they have the lecture term from four to five months, teachers and students will have additional time to carefully study points which could only be touched upon in the most general manner in the former period (or if the attempt was made to grapple the details necessary for a proper understanding of the subjects treated, the forcing or cramming system had to be adopted, which afforded little opportunity for the brain of the student to act in any other way than as a mere memorizing rather than as a reasoning organ). In addition to this the curriculum of instruction has been enlarged

in some of the institutions by establishing new departments in which the principles of medicine and practice of surgery will be taught in as minute and extended a manner as in the best medical schools. Thus, while being trained for the practice of dentistry as a specialty, the student will have at the same time an opportunity of becoming thoroughly grounded in the great principles underlying the general practice of medicine and surgery, and be prepared, after witnessing the surgical operations in the clinics of the colleges and hospitals, and repeating these on the cadaver under the supervision of competent demonstrators, to perform the same if required to do so when engaged in the practice of the profession. Demanding as the dental profession does for the proper performance of its varied duties, a high order of manipulative skill, it gives that constant training to the hand which is so necessary and invaluable in the performance of the major or minor operations of surgery. The disinclination manifested by the majority of medical practitioners, particularly those residing in rural districts, to assume the responsibility of performing such operations, opens to the dentist who may be prepared and willing to undertake them, a field of usefulness, which, while benefiting his patients, will at the same time reflect additional credit upon the dental profession. The objections which used to be urged with so much pertinacity in our associations against the dental practitioner being qualified for and engaging in such duties have apparently lost their weight, for those who were most opposed to the step have not only been silenced, but now tacitly, though quietly, favor such a movement by adopting the same course.

It remains to be seen whether the advanced step taken by the institutions named will secure the hearty support and sympathy of the profession at large, neither asking nor granting favors as they do, and holding out no other inducements than thoroughness in the course of studies pursued, and asking encouragement and support only for services properly rendered, and duties faithfully discharged. The restless mental activity (the earnest reaching out for more light) manifested by the profession during the past few years, and which has commanded the respect of all observers, indicates on the part of its members a desire for substantial fruit, and that, longing for knowledge, they will take advantage of the opportunities now afforded to obtain a scientific education such as every professional man should possess. As stated in former communications, this can be best secured under the guidance of competent instructors whose experience as students enables them to *teach others how to learn and to think*, by presenting science to their pupils in that systematic and orderly manner, whereby the mind can grasp it as a homogeneous whole, admirable for its order and harmony, rather than as a heterogeneous mass, in which a multitude of isolated facts appear to the inexperienced student to constitute a labyrinthine maze, wherein confusion worse confounded only reigns.

J. H. McQ.

PERISCOPE OF MEDICAL AND GENERAL SCIENCE IN THEIR RELATIONS TO DENTISTRY.

BY GEO. J. ZIEGLER, M.D.

"*Influence of Extreme Cold on Nervous Function.* By BENJAMIN W. RICHARDSON, M.A., M.D., F.R.C.P., Senior Physician to the Royal Infirmary for Diseases of the Chest.

"PART II.—PRACTICAL.

"In my last lecture I commenced by showing from direct experiment the various stages of preaction, inertia, and reaction produced on the living body by the application of cold to the peripheral surface of nerve. I next described the effects of the same agency on nerve-cord, on the cerebrum, and on the cerebellum. In illustration of the effect on the cerebrum, I froze this organ in a pigeon, producing deep stupor and insensibility. The animal began, however, to recover during the lecture, it quickly regained all its natural functions, it has remained unaffected, and here it is now, as healthy as if it had not been subjected to any disturbance of its physical condition. Proceeding onwards, I described the symptoms which ensued when the cerebellum was frozen, and these symptoms we can again demonstrate. Here is another healthy pigeon. We render its cerebellum inactive by directing over it for a minute or so compound ether spray. Observe, there is first torpor, then movement backward, and soon a complete and rapid backward sommersault, without the least bodily injury or sign of pain. Were it necessary, by reapplying the spray, these sommersaults and backward movements could be made to reappear many times with the most rigorous certainty.

"Lastly, I passed to consider the influence of cold on the medulla oblongata and the spinal cord, showing especially that when the medulla is frozen death at once results from arrest of the respiratory power.

"OMITTED FACTS.

"In the last lecture two important facts escaped notice, which facts I now proceed to supply. The first of these facts is as follows: In a warm-blooded animal even actual freezing of living structure may be induced without any stage of preaction, provided always that the heat be abstracted with sufficient energy and rapidity. Let me demonstrate this on my own body.

"We have here for our spray apparatus a very light hydrocarbon fluid, called rhigolene. It was sent to me by Professor Donaldson, of Baltimore, and it is used extensively in America for the production of local anæsthesia. It boils at 70° Fahr. Dr. Sedgwick will direct a large spray of this on my arm, and, as you see, the process of freezing is immediate. The part, a moment since flexible, warm, and sensitive, is now hard, cold, and absolutely insensible. There has been no redness, no pre-exalted sensibility, no evolution of heat—in short, no stage of *pre*action. All the parts have been rendered inert together, and when the cold is withdrawn recovery is equally rapid, and is without *re*action. Some day we may have a means of extending this rapid inertia, so as to make the whole of a limb insensible and to operate on a part some considerable

distance from the point where the application is made. This process of rapid freezing is the best and safest.

"The second omitted fact is this. When the process of sudden freezing is brought to bear on the whole cerebro-spinal system of a cold-blooded animal, every function of life is immediately suspended. Here is a large, powerful frog. I direct the rhigolene spray on the head and spine for a few seconds. I place the animal thus petrified in your hands; it is like marble—a hard frozen mass. You would declare it dead; it only sleeps. As it takes up heat from the surrounding air, its pulses recommence; in a short time it leaps; it lives again, and it sustains no injury. If you ask me how long a frog could be kept in the state of temporary death we have here seen, I answer that time seems to me to make no difference as to results, the conditions being sustained. I have every reason to believe that if the animal were kept thus frozen for a century, or any number of centuries, it would live again as well as ever on restoration of warmth. By this freezing we have fixed all the water of its tissues; we have stopped evaporation, we have suspended motion, we have arrested waste; but we have done no injury that may not be removed by the re-solution of the water and by the re-communication of motion, from the act of re-solution, to the particles of water.

"We may illustrate the phenomena thus observed by experiment on a lower mechanism; and, although the illustration is necessarily extreme, it is useful, as familiarizing the mind to the study of physical effects proceeding from a common cause. I take my watch and find it is in motion; its hands move under the influence of force derived from the mainspring, which mainspring is inclosed in a small box lying at this point. I bring extreme cold to bear on the box holding the mainspring; I change in this manner the condition necessary for the work of the spring, and the watch immediately ceases to go. It is not physically injured, but it is stopped, and it would remain stopped for any length of time, the conditions being precisely the same. I change the conditions; I allow the watch to absorb the surrounding heat, and in time of itself it goes again. In the watch the cold stopped the motion by modifying the molecular condition of the metals. In the frog the water stands in the place of the metals, and the cold stopped the motion by acting upon the water.

"HYBERNATION.

"It is impossible to observe the phenomena of prolonged and profound insensibility produced on the frog by cold, with the entire recovery that follows, without recalling the simple and analogous process brought to bear on animals by Nature herself. In the process of hybernation, Nature not only displays to us the same order of phenomena, but uses the same means for the production of the inertia—viz. cold—and the same means—viz. warmth—for the restoration of motion. And as, in nature, some warm-blooded animals are put to sleep by cold (the dormouse, for example), so in these we may predict that art will be able to bring about the same condition. In fact, in a bird, as we saw at last lecture, the thing was done. It will be an interesting study for some future comparative anatomist to discover why animals that hybernate come so readily under the influence of cold. There must either be some peculiarity of construction, which enables the cold to reach and act upon their nervous centres with special activity, or the nervous centres themselves must be specially susceptible to the influence of cold.

"PRACTICAL INFERENCES.

"The observations which these researches on the influence of extreme cold on nervous functions call forth are so varied and so rich in suggestion, it is difficult for the mind rapidly to take them in in all their fullness. Vasco Nunez, standing on the height of the Darien, and exclaiming, as he saw for the first time the Pacific Ocean, 'The sea! the sea!' could hardly have cause for wonder more. We are brought, as it were, to confines of reality, where before there was obscurity only and doubt and dream. We feel that in time the physiologist will pass by the poet, and, as he proceeds in discovery, will place fact in that high place which, as yet, in the history of the world, fancy has claimed as her especial domain.

"Such few points of practical moment as I may on this occasion bring and string together are, of necessity, as minute as the time in which they have been studied has been short. Still they will awaken the attention, as I hope, of many, and fascinate a few.

"Influence of the Conditions of the Water of Nervous Matter on Nervous Functions.

"The first subject to which I would invite your attention has reference to the influence of water, under varying conditions, on nervous function. You will see by the table before us that water forms above 80 per cent. of nervous structure; albumen forms 7 per cent.; the remainder is fatty matter and salts—mainly phosphatic salts. It seems to me, from the experiments which I have conducted, that all the phenomena of disturbed natural function we have seen depend chiefly on modification in the physical condition of the water; on the transferrence of the water from the fluid to the solid state. In freezing nerve-matter we take from the water its heat of fluidity, or the force which, holding its molecules apart and giving them motion, supplied the condition for that mobile and active state which is the fluid state of water. We have crystallized the water of the nervous matter in all the cases in which we have frozen it. We have reduced it by this means from activity toward inertia; therewith we have deprived the structure of the power to maintain what is called life. The proof that upon the water having undergone solidification the principal phenomena rest, is proved by the fact that when the crystallized frog is warmed again, when it is allowed to take up heat from the surrounding air, it recovers its powers. In these animals the tissues are so thin, and such fair conductors of heat, that the heat can immediately act upon the nerve-substance, and can set the solid mass at liberty. In this respect frogs and animals, constituted as they are, differ from warm-blooded animals. Warm-blooded animals, evolving more heat from within and requiring more heat, are usually protected naturally with non-conducting skin and fur, or feathers, so that their heat is sustained by being retained in their bodies or conserved. But, because they are thus protected from undue loss of heat, they are also rendered incapable of directly taking up heat in sufficient degree to restore instantly the heat of fluidity of their fluids and tissues when that is withdrawn. In chilling their nervous centres, therefore, we have to be most careful so to limit our operation as not absolutely to stop the respiration and circulation. We may render them insensible in the profoundest degree; we may bring them so nearly to death that they seem dead, and if we permit the merest remains of their fire-producing apparatus to continue in play they will

recover. But it is essential that we let the fire remain alight. In hybernating animals, during hybernation, this is the secret of their recovery—the fire never goes quite out.

"In speaking of the crystallization of nerve-matter by cold, I have ventured to insist firstly and chiefly on the solidification of the water; but in nerve-substance there is also a considerable per cent of fatty matter, which when heated is fluid, like water, and which also, like water, loses its heat of fluidity, crystallizes, and becomes solid by cold. When, then, we freeze the brain, we solidify this fat also, and, what is more, we solidify it at a temperature at least thirty degrees higher than the freezing point of the water; and as this fat, solidifying first, becomes a bad conductor, so it impedes and limits the freezing of the whole mass of nerve-substance. In hybernating animals I should think the fatty part of the brain and cord is intensely solidified by the cold.

"This form of crystallization of nerve-matter, whether of water or of fat, is simple; it is, however, not the only form of solidification that can be induced. We can solidify nerve-matter so as to destroy its function by two other means at the least—viz. by withdrawing the water from the albuminous constituent of nerve, and by altering the constitution of the albumen by heat. I can illustrate this subject by a very simple experiment. In this beaker there is a solution physically the same in composition as brain-matter; it is in a state of fluidity. I take up a little of this fluid with a soft brush, and paint a surface of glass plate with it. I now, on the opposite side of the plate, project rhigolene spray, producing intense cold. You see the fluid becomes white and solid, and adherent to the glass. It is crystallized and solidified. I take another portion of the same fluid, paint another glass plate with it, and this time, instead of using cold, I drop on a little absolute alcohol. The alcohol as it intermingles seizes the water with evolution of heat, and again there is whitening and solidification of the fluid, with adhesion to the glass. In this case, the molecular condition being changed, the albumen is precipitated, and assumes, with the water, the solid state. On a third plate of glass I put a little more of the fluid, and then gently apply heat; once again, observe the same objective phenomena—whitening, solidification, and adhesion to the plate. Here, again, it is the albumen that has undergone change; it, with the water diffused through it, has produced a solid mass—a condition also akin to crystallization. If I varied this experiment by directing the same processes to living nervous matter, I should induce similar series of phenomena on the nerve-substance; and in so far as alteration in the function of the nerve is concerned, I should produce disorder of function in every case identical. One difference—and it is an essential difference in some respects—would be presented, and it is this. If the nerve were solidified by cold, it would quickly regain its function under the influence of heat; if the nerve were solidified by alcohol, it would slowly and imperfectly regain its function; while if the nerve were solidified by heat it would, according to our present knowledge, be destroyed in regard to function altogether.

"We cannot leave this part of our subject without being led to the contemplation of the influence of other and more refined agencies acting upon the cerebral and spinal matter. What is that change in nerve produced by a blow or communication of great mechanical force: nervous shock? What is the change produced by pressure? What is the nature of the change induced by loss of blood, by choleraic flux, by the heat

of fevers, by what are called powerful odors, by strong external impressions—alarms—acting on the brain? When we see how the molecular condition of nerve can be transformed and the function of the injured part modified by cold and by heat, by abstracting and intensifying force, we gain, I think, a physical reading of these other influences as yet, of course, obscure, but still with light stealing into the obscurity."—(*Med. Times and Gaz.*)

Invention of Local Anæsthesia by Refrigeration.—The credit to this being in question, Dr. James Arnott, in a letter to the *Med. Times and Gaz.*, claims the discovery of the principle of local anæsthesia by cold. He observes: "As it is well known to the profession that the discovery was made by me, many years ago, of the possibility of freezing the animal tissues without injuring them, and that this process might be used beneficially both as an anæsthetic in operations and as a remedy of disease, I need not at present do more than allude to it. What it is more necessary to elucidate is the great difference which exists between the invention of the principle of any new therapeutic proceeding, and the invention of any other means of carrying this principle into effect than those which have been originally proposed. All that Dr. Richardson can claim has relation merely to the latter. The principle of his method of anæsthesia is precisely that which I discovered in 1848.

"After relating his unsuccessful attempt some years ago to produce anæsthesia by what he called voltaic narcotism, 'I came,' he says, 'to the conclusion that Dr. James Arnott's plan of using extreme cold was the first true step in the progress of discovery, and that if it could be made easier of application, and at the same time could be combined with the use of a narcotic fluid, an important advance in therapeutics would necessarily follow.' The supposed second true step, I presume, and the step intended to reach the goal, was (as far as concerns the principle) this combination of a narcotic agency with intense cold, and it was represented to be a very great advance; for by the narcotic fluid (ether) there was to be produced 'the deepest anæsthesia,' giving the power of amputating a limb painlessly. No wonder that a method of such pretensions should have been so well received by the profession; but, unfortunately, it was soon discovered that the second 'step' was an utter delusion. Dr. Richardson is not the only one who has fallen into this error. The same idea of a combined agency had been maintained by M. Richet, the original proposer of anæsthesia by vaporized ether, and who also, upon the strength of it, claimed the invention of a principle in some respects new.

"The principle, then, is precisely the same, whether the intense cold is artificially produced by the rapid solution of ice and various salts, or by the rapid evaporation of volatile fluids. * * *

"Questions of minor importance in this inquiry are, When and by whom was anæsthesia by evaporating ether first practiced? It was first practiced in Paris in 1854, and about six years after the invention of local anæsthesia by cold. M. Richet dropped the ether on the part, and quickened its evaporation by a bellows. Soon afterward, M. Guéraud projected the ether on the part from a syringe of peculiar construction. Then followed the invention of the pulverization of fluids, or their conversion into spray, by Dr. Sales-Girons, the principle of which was, as a matter of course, soon adapted to the construction of instruments for anæsthesia by those who had been employing ether in preference to freez-

ing mixtures. At a discussion on the subject in the Surgical Society of Paris (reported in the *Gazette des Hôpitaux* of March 24th last), it was mentioned by M. Desormeaux that he had employed such an instrument years before, and by M. Velpeau that his pupils at the Hôpital de la Charité had used the more simple expedient of the perfumer's spray-producing tube. Dr. Richardson's instrument is constructed on the same principle, and has been followed by other instruments in France and elsewhere. But the method of producing anæsthesia by freezing mixtures, which M. Velpeau calls in the discussion referred to '*un moyen d'anesthésie locale très simple et très efficace*,' has generelly been preferred by French surgeons."

In his reply (*Ibid.*), Dr. Richardson says: "1. I have never directly, indirectly, nor in any way whatever, laid claim to the natural discovery that extreme cold is a destroyer of sensation. Such a claim would be foolish. Neither have I claimed the first application of that natural discovery to the necessities of medical practice. Such a claim would be false.

"2. In respect to Dr. Arnott, my recognitions of his labors have been unbounded. In every paper I have written, in every address I have spoken, whenever the question of principle was under consideration, I have invariably put him foremost.

"3. In my first essays, as he says, it is quite true I did think the anæsthetic action produced by ether was due in part to cold and in part to the ether acting as an independent narcotic. It is equally true that this, in the vulgar sense, was an error. It was an error, however, detected almost as soon as it was made, and it was admitted and retracted instantly. But even as an error it was useful, because if I had not fallen into it I should hardly have discovered the fact or made the generalization that local and general anæsthesia are the same processes, and that narcotics, one and all, act on the common principle of reducing organic calorific force.

"4. I am convinced that Dr. Arnott cannot have made himself acquainted practically with the advantages of ether spray over any freezing mixture, or he would recognize those advantages as fully as the rest of his brethren. For local anæsthesia to be generally acceptable and useful in practice, it must be brought as a process within the requirements of practice. It must be at hand at all hours, at midnight and at noon the same; at all seasons, at midsummer and at midwinter the same; at all parts of the world, at the tropics and at the polar regions the same. Further, it must be so completely at hand that the administrator can go with it direct to the bedside and apply it cleanly, neatly, effectively, immediately. No freezing mixture answers at all to these imperative demands; the ether spray meets every one of them. The spray is ready as chloroform, and therefore it rivals with chloroform. Further, any one who has used the spray properly knows that in action it is better than any known freezing mixture, and for its purpose, indeed, is practically perfect. With a good compound ether and a fish-tail jet the production of insensibility is a matter of from two to six seconds—insensibility which, in twenty or thirty seconds more, can be extended over a surface large enough for any operation in surgery: while for deep operations the insensibility can be carried wherever the knife can travel, and well-nigh as fast. I have thus successfully used the spray for the largest as for the smallest of operations—for amputation of the breast, for removal of large and deep-seated

tumors, and for Cæsarian section, as readily as for opening an abscess or incising a carbuncle. What is more, from the extreme rapidity of action now attainable, pain of application is reduced to the merest uneasiness, and slough is altogether prevented as a sequence. In like manner, for the treatment of deep-seated pain and inflammation the spray surpasses, not only in conveniency, but in efficiency, any freezing mixture. I have used it recently, with an effect almost magical, for removing the excruciating pain arising from the passage of a gall-stone. By experiment on an inferior animal, I can, moreover, demonstrate with it at any time the actual solidification of the brain substance itself, through the parietes of the skull.

"Readiness for action, intensity of action, surety of action, success in action, control during action, and safety after action—these are the advantages of ether spray. They stand in happy combination, drawing the most listless to them irresistibly. These are the advantages which have made the spray invention so popular. With the invention the members of the profession feel (and hundreds of them have expressed the feeling to me) that local anæsthesia is in truth an available remedy in the many cases in which, according to their judgments, it is likely to be a useful remedy. It is for this the profession is satisfied with the part I have taken in constructing for it a simple, trusty, practical weapon against disease. If for centuries medical men had known in such a manner we can produce insensibility to pain, but under conditions too remote to be always and immediately applicable, and nothing more, then for centuries local anæsthesia would have had no practical existence. It would have stood as the offering of bread and the giving of a stone: for a discovery, however grand, which would be useful if it could only be easily applied, stands often in worse estimation than does a discovery which is absolutely and confessedly useless. The first tantalizes; the second beguiles. * *

"8. As regards my own work, I claim simply and honestly the introduction into practice of the method of applying ether or other volatile fluid in the form of spray, so as to produce anæsthesia by the natural benumbing agency of cold. I claim to have made this agency available to the immediate wants of every medical practitioner, and to have transformed local anæsthesia from virtual uselessness and even disrepute, into an instrument of living, daily, lasting service to the human race and to those below them in the scale of creation. I claim, further, that the improvement was the result of many years of laborious and thoughtful experimental study, and that it could not have followed a less severe line of research. Dr. Arnott might well have anticipated me in this had he pleased, for the road to advancement was by himself left wide open; but he was content with a good principle and a bad practice, while I strove and succeeded to bring the practice to a fair level with the principle.

"9. The insinuation by Dr. Arnott that in inventing ether spray I was servilely copying some unsuccessful experiments conducted in France is so unjust—is so foundationless—I could hope, for his own sake, he will on reflection withdraw it. If by such innuendo he could for a moment strip me naked of all credit, he would in no way advance his own case, but would rather show how a really great mind can destroy its own character by littleness of heart. I can only repudiate the insinuation with sorrow. Not a case of any operation nor of any experiment with ether spray was published previous to mine, nor does any one in France make a claim to such position. On the contrary, the French have been

among the first to recognize my advancement, and to identify it as mine. So large is the use of my instruments in Paris, that one well-known West End firm of surgical instrument makers informed me lately of his supplying a single order to Paris 'for thirty-six dozen of the Richardson apparatus for local anæsthesia.'

"In conclusion, there is not the slightest need for any disagreement between Dr. Arnott and me. I acknowledge freely, proudly, my respect for his genius, his originality, his industry, and, I do not hesitate to add, his prejudices. I have never touched his good fame except to try to do it honor, and the only fault he can find with my work is that it has brought a science which he founded to such good practical action that the world admires it. If that work had not been done, Dr. Arnott's preceding work had not been better known, and so much human suffering, for months past saved, had not been relieved. Following the bent of my own ambition, I might fret that our positions are not reversed. But I am content because I have been useful, and because I am clothed with the consciousness that any credit that has befallen me is no more than the natural sequence of an earnest desire to be useful according to the gifts which have been apportioned to me."

"*On Food and Digestion.*—By R. DEXTER, M.D., Chicago, Ill.

Classifications of Food.

Nitrogenous.	Albumen. Caseine & Fibrine.	Non-Nitrogenous.	Hydro-Carbons and Fats.
			CARBO HYDRATES. Sugar, Starch, and Gums.

Food—Physiological Classification of.

Tissue-making Food.	Albumen, Fibrine, and Caseine.
Sugar-making Food.	Gluten, and Chondrine.
Fat-making Food.	Sugar, Starch, and Fats.

Processes Wrought in Different Organs.

Mouth—Changes in.	Mastication, and Insalivation. We have partial conversion of Starch into Glucose.
Stomach—Changes in.	Albumen. Fibrine, Caseine, and Animal Jelly.
Duodenum—Changes in.	Sugar, Starch, and Fats.

"As the result of the digestive processes, we have the following:

"Albuminose, consisting of Albumen, Fibrine, and Caseine.

"Gelatinose, consisting of Gluten, and Chondrine.

"Glucose, consisting of Sugar, and Starch.

"Adipose, consisting of Fats.

"The whole digestive mass gains entrance into the blood by two separate routes, viz., lymphatics and veins.

"1. Lymphatics of the small intestines absorb the adipose emulsion with an albuminous coating of each globule.

"2 The balance of the albuminose, with the whole of the gelatinose and glucose are absorbed by the veins of the small intestines, and pass to the liver through the portal vein.

"3. In the liver the albuminose becomes albumen, the gelatinose becomes sugar, and the glucose becomes fat.

"4. Liver sugar is carried to the lungs, where it is converted into lactic acid.

"5. In the transit of the emulsion through the intestinal lymphatics fibrine and the white corpuscles of the blood are organized and elaborated.

"6. In the spleen a portion of fibrine, white corpuscles, and serum of the blood are organized and elaborated.

"7. (Conjectural.) Old red corpuscles disorganize in the spleen, and from the debris fibrine is the only constituent that serves any useful purpose; the residue is excreted.

"8. The white corpuscles, in their passage through the spleen, elongate and burst, setting their nuclei free. These nuclei absorb hæmatin, and become red corpuscles, while the wall of the bursted corpuscles becomes fibrous.

"9. But the liver is the grand laboratory of red corpuscles. The hepatic vein is richer in both red and white corpuscles than any other vessel of the body. The splenic vein is next in richness of red and white corpuscles to the hepatic.

"10. Assimilation takes place outside of the blood-vessels. The exuded plasma saturates every structure of which we are composed, and decayed portions of the tissues are replaced by the appropriation of a sufficient amount of the nutritive pabulum.

"11. The bile is not a digestive fluid; it is both secretory and excretory. A secretion always serves some further useful purpose in the system, and is never found in the blood.

"12. There are no essential changes wrought upon animal fats either by digestion or assimilation."—(*Chicago Medical Examiner.*)

"*Artificial Milk.*—At the last meeting of the Academy of Medicine, M. Giboust, Professor at the School of Pharmacy, called the attention of the medical world to the description given of the artificial milk invented by Baron Von Liebig, and regretted very much being obliged to enter into a controversy with him. After having reminded the assembly of the composition of this milk, and insisting upon the difficulties attending the preparation of such aliments in places where it might be most necessary, such as with wet-nurses or small families, M. Giboust added that we have at our disposal a natural product which more nearly resembles human milk than does a mixture of cow's milk, flour, malt, lactate, and butyrate of potash. It is cow's milk itself. On an average, human milk contains

a little more water, more sugar of milk, less butter and caseine than cow's milk. Thus, by taking the latter, and adding a little sugar and a fifth of its weight of water, we have an aliment, at the disposal of everybody, forming a better substitute for human milk than any artificial compound.

"M. Depaul, on his part, declared that he undertook experiments on new-born children, to examine the effects of this artificial milk, the taste of which was, by-the-by, less agreeable than that of natural milk. Four children were tried. The two first were twins, and born prematurely. In spite of the care bestowed on them, and the nourishment by the artificial milk, they died in two days. The third, born at full time, weighed 3 kilogs. 370 grammes; the mother was ill. The nourishment given was that of artificial milk. At the end of two days, the dejections became green, and on this day the child perished. The fourth infant, born under the same conditions, and nourished with the same aliment, died after four days. M. Wurtz promised to write to Baron Von Liebig, to obtain more precise details on the preparation of this milk."—(*Ibid.*)

"*Liebig's Milk.*—BARON LIEBIG terminates a letter to the Académie de Médecine, in which he confutes some of the statements of his chemical opponents, with these words: 'I can assure the Academy that I had never the least idea of substituting for human milk, when a sufficiency of it could be obtained, the preparation which I have proposed, and which very certainly, as stated by M. Boudet, as regards its density, taste, and composition, is but a rude imitation of so perfect a model. Still, it is a fact that has been established during the last two years, that thousands of infants of the Teutonic race, deprived of their mothers' milk and nourished with this "strange compound," have thriven surprisingly well. As to cow's milk of a "uniform composition," I acknowledge its excellent effects without any reserve; but such normal milk is little better than a myth, and very different from the cow's milk which we meet with in trade and in great towns.'"—(*Med. Times and Gaz.*)

"*Relative Frequency of Particular Diseases in the Different Sections of the United States.*—The medical profession have long been persuaded that certain diseases and pathological conditions existed in a greater ratio to the population in some States and sections of the Union than in others, but it is only recently that statistics of an extensive and trustworthy character upon these points have been collected in sufficient numbers to give scientific value to the fact.

"The physical condition of the male population in 23 States, between the ages of 20 and 45 years, as shown by the records of the Provost Marshal General's office, comprising examinations of over 1,000,000 of drafted men, which have been tabulated by Surgeon J. H. Baxter, U. S. V., and published in the report of the Secretary of War, possesses great interest not only to the statesman but to the medical profession. Whether the numbers examined, considering the comparatively few disqualifying conditions met with in some States, warrant the compiler in establishing all his averages and deductions, remains to be confirmed or disproved by further investigation. At all events no facts comparable in extent and scope of inquiry regarding the physical condition of our population have ever been projected or compiled. A further and final report from materials in the same office is now in process of preparation which will

further illustrate the physical condition and health ratio of the male population of the middle period of life in the United States. * * *

"*Bones, Chronic Diseases of.*—There were exempted from the whole number of drafted men examined in the United States 2296 from this cause, which is at the rate of 3·79 in the thousand. It was found to be a disqualifying disease prevalent more or less in all the States, and in the greatest ratio in the following three: in Maine, out of 23,564 examined, it prevailed at the rate of 7·26 in the thousand; in Wisconsin, where 23,457 were examined, its ratio was 6·99 per thousand; and in Connecticut, in the examination of 11,017, it disqualified at the rate of 5·62 in the thousand. * * * * * *

"*Neuralgia.*—This condition disqualified 117 drafted men on the examination, which is at the rate of ·19 in the thousand. No exemptions were granted for this condition in any of the following States: Rhode Island, New Jersey, Delaware, District of Columbia, West Virginia, Kentucky, Ohio, Indiana, Illinois, Iowa, Missouri, Minnesota, or Kansas. The three States where the exemptions were largest were New Hampshire, where, in the examination of 10,389, it was found to be at the rate of ·77 in each thousand; Massachusetts, in 36,380 examined, ·60 in each thousand; and New York, where 115,668 were examined, ·33 in the thousand. * * * * * * *

"*Teeth, Loss of.*—There were exempted from military duty of the drafted men examined 10,810, or at the rate of 17·87 in the thousand. The average of exemptions from this cause was found to be lowest in the two following States: West Virginia, where 1815 were examined, the rate of exemption was 7·16 in the thousand; and in Kentucky, in an examination of 18,816, the average was 7·67 in the thousand. In the following three States the exemptions ranged highest: in Massachusetts, in the examination of 36,380, the average number disqualified in each thousand was 34·55; in Connecticut, where 11,017 were examined, the average number exempted was 27·68 in each thousand; and in Pennsylvania, where 144,724 drafted men were examined, this condition prevailed to an average that disqualified from military duty at the rate of 20·77 in the thousand."—(*Medical Register, District Columbia*, 1867, and *Galveston Med. Journ.*)

"*On the Cause of the Premature Decay of the Permanent Teeth.*"—At a meeting of the Western Medical and Surgical Society of London, Dr. Martyn read a paper on this subject. The author's view is, "that teeth perish prematurely because they are faulty in structure, faulty in a too porous and fragile enamel (often marked by a chalky appearance) and dentine, and, their other structures being of no better quality, they yield more or less early to the wear and exposure to which they are subject. The defects of structure, he believes, are not due to delicacy of health—want of vital force, so to speak—but really to insufficient use during the formative process or development of the teeth. Human teeth are intended to grind grain, but in civilized life, from the cradle upwards, they have really little of their natural work to do; but cookery does it for them. A crust of bread is nearly the chief *pièce de résistance* put to table. There is enough, doubtless, of tough meat, but this does not give grinding work. The supporting structures of the teeth—viz., the alveolar processes—suffer in a like degree from insufficient use. This is shown in any mouth from which a grinder has been removed. The opposing tooth

soon projects from its bed into the space of the lost tooth; next its fangs become exposed, the tooth loosens, and ultimately drops out, or it may be that caries attacks the parts unsheltered by enamel, and the tooth is lost. What happens is, that the alveolar process connected with the unopposed tooth, losing its natural stimulus—grinding pressure—becomes absorbed, its lining periosteal membrane degenerates, probably becomes spongy, and so forces the tooth from its bed. The author has endeavored for some time to carry his views into practice, and has selected the navy biscuit as a suitable article of diet in the place of bread."—(*Med. Times and Gaz.*)

"*Double Hare-Lip.*—Dr. GREENE exhibited to the Berkshire District Medical Society a case in which an operation had been successfully performed. He said this was one of the cases where many surgeons would have depressed the central piece, an operation which he thought was too frequently practiced. These cases are almost always associated with cleft palate, and oftentimes the unsightly *protuberance*, so called, occupies the proper position of the upper lip in what *should* be the profile outline, the deceptive appearance arising from the flattening of the nose and disappearing as the nostrils are raised and the lateral flaps approximated by free dissection. If cases were more carefully studied, in this particular, the middle portion would be much less frequently interfered with."—(*Boston Med. and Surg. Jour.*)

"*A New Method of Resuscitation from Hyperanæsthesia by Chloroform.*—At a recent meeting of the New York Academy of Medicine, Dr. WORSTER read a case in which chloroform had been administered to a patient, by a party whom he regarded as competent, as a preparatory step to an operation, by himself, for the relief of hæmorrhoids. Suddenly the patient had stertorous breathing, became pulseless, and exhibited all the symptoms of a speedy dissolution; but by the simple expedient of reversing his position, and inclining his body to an angle of forty-five degrees, he was fully restored."—(*New York Med. Record* and *Boston Med. and Surg Journ.*)

"*Cements and Uniting Bodies.*—In the preparation of cements and all substances intended to produce close adhesion, whether in a semi-fluid or pasty state, freedom from dirt and grease, without slovenliness, is a most essential and necessary condition.

"*A Temporary Cement*, to fix optical glasses, stones, jewelry, etc., on stocks or handles for the purpose of painting, repairing, or ornamenting, is made by melting together, at a good heat, two ounces of resin, one drachm of wax, and two ounces of whitening; with this applied to the article when heated, secure fixation may be obtained, unfixed at pleasure by the same means, viz., heat.

"*Rice Cement*, which is made by mixing rice flour intimately with cold water, and then gently boiling it, forms a beautifully white preparation, and dries nearly transparent; it is capable of bearing a very high polish, and is very durable; it is in every respect far before the common paste made with wheat flour or starch; it may be formed, also, into a plastic clay.

"*For Uniting Stone, Derbyshire Spar, etc., etc.*, melt together four ounces of resin and half an ounce of wax, and about an ounce of finely-

sifted plaster of Paris. The articles to be joined should be well cleaned, and then made hot enough to melt the cement, and the pieces then pressed together very closely, so as to leave as little as possible of the composition between the joints. This is a general rule with all cements, as the thinner the stratum of cement interposed the firmer it will hold.

"*Cement for Chemical Glasses.*—Mix equal parts of wheat flour, finely-powdered Venice glass, pulverized chalk, and a small quantity of brick-dust, finely ground; these ingredients, with a little scraped lint, are to be mixed and ground up with the white of eggs; it must then be spread upon pieces of fine linen cloth, and applied to the crack of the glasses, and allowed to get thoroughly dry before the glasses are put to the fire.

"*Puzzuolana Cement.*—A kind of earth thrown out of volcanoes, of a rough, dusty, granular texture; its most important property consists in making a cement when mixed with one-third of its weight of lime and water, which hardens very suddenly, and is more durable under water than any other. Manganese is found to be a valuable ingredient in water cements. Four parts of gray clay are to be mixed with six parts of the black oxide of manganese, and about ninety of good limestone, reduced to fine powder, the whole to be calcined to expel the carbonic acid; when well calcined and cooled, to be worked into the consistence of a stiff paste, with sixty parts of washed sand.

"*The Diamond Cement* for glass or china is nothing more than isinglass boiled in water to the consistency of cream, with a small portion of rectified spirit added. To be warmed when used.

"*Leaky Skylights* may be stopped and cured with Dutch rushes, bedded in and covered with good white-lead. On wet making its appearance it quickly attacks the rush, which swells up so tight and firm that all progress of wet and droppings is effectually stayed.

"Lemery, the chemist, used the following lute for stopping retorts, etc.: Fine flour and fine lime, of each one ounce, potter's earth half an ounce; make a moist paste of these with white of egg, well beaten up with a little water, and this will be found to stop exceeding close.

"Philosopher Boyle recommends, on experience, the following for the same purpose: Some good fine quicklime and scrapings of cheese, pounded in a mortar, with as much water as will bring the mixture to soft paste; then spread on a piece of linen rag, and apply it as occasion requires.

"A most valuable glue for photographers, and extensively used by first-class bookbinders, is made from bottle india-rubber. This must be dissolved in highly rectified spirits of turpentine: the highly rectified spirit extracts every particle of grease, which is of the greatest consequence. As I have somewhere before remarked, it is not exactly what you do, but the way in which you do it; grease, above all things, is a most determined enemy to any of these preparations."—(*Photographic News* and *Sci. Amer.*)

Oxychloride of Magnesium.—The Paris correspondent of the *Chemical News* says: "M. Dumas lately called the attention of the Academy of Sciences to a new industry of M. Sarel, which nothing could lead us to foresee, viz., that chloride of magnesium can unite and associate with magnesia or oxide of magnesium to form an oxychloride of magnesium, perfectly insoluble and possessing, as does the oxychloride of zinc, in a degree incomparably greater than plaster of Paris, the property of not only taking all variety of forms, but of causing the solidification and taking a high polish

of a great number of substances with which it may be mixed, in the proportion of a fifteenth to a twentieth of their weight. Experiments made two years ago leave no doubt on the good quality of stones prepared by this process, and the absolute resistance, of objects so fabricated and moulded, to the deleterious action of water. Industry and art will therefore enter into possession of new elements of construction and transformation. The chloride of magnesium that can be extracted from sea-water, or which is found in great quantities solidified in interior seas as that of Stassfurth, does not require to be entirely pure, and costs less than the oxychloride of zinc."

"*The Flow of Solids.*—M. TRESCA's paper read at the Paris meeting of the Institution of Mechanical Engineers, was interesting, and it was the opinion of many of those who heard it, that it foreshadowed important improvements in the working of metals. Thus far, we believe, however, no direction in which M. Tresca's researches will have a practical bearing, has been indicated, yet it does not follow that their ultimate results can at once be foreseen. That the particles of solids of which the form is altered must move upon each other, and in the direction of least resistance, is of course a physical law, long known to many. More than twenty years ago M. Remond made silver pencil cases by punching a flat plate of silver into a tube, and drawing this out; and Mr. Parkes, of Birmingham, now makes tubes in this manner. The beautiful process of stamping metallic capsules, is another interesting instance of the flow of solids. The soft metal is placed in a shallow circular recess, and a die, slightly smaller than this recess, is stamped upon the metal, which instantly runs up the die and uniformly around it, to a height sufficient for the capsule. Cold rolling, cold tube-drawing, etc. are all examples of the flow of solids, and so indeed is all forging and working in heated but not liquefied metals, since they are then solids of but moderate cohesion. With the exception of M. Tresca's experiment of forcing a pile of lead plates into concentric tubes, we have long been familiar with much of what was shown by his specimens, especially with the grain of the iron in forgings when brought out by acid. Lead pipe and bullets have long been 'squirted' by hydraulic pressure, and Mr. Weems has even pretended that, in pressing an alloy of copper and zinc, he separated those constituents from each other. The most beautiful example in the arts, however, is the latest—the accurate pressing out of a thin tin tube within a lead one, from an ingot of tin placed within one of lead, practiced in the new lead-encased tin pipe manufacture, in this city."—(*Sci. American.*)

"*Phenomena of the Combustion of Metals.*—Whenever thin sheets of metals are used to connect the poles of galvanic batteries, as gold or silver leaf, tinfoil, etc., and in that position subjected to a current sufficiently powerful to produce combustion, the different metals burn with a kind of hissing noise and with variously colored light. Gold burns with a bluish-white light, and leaves a dark-brown oxyd; silver burns with a light sea-green color, and emits a grayish vapor; copper gives out a bluish-green flame, mingled with red sparks and green smoke; zinc burns with a dazzling white light and white vapor; tin throws off red sparks, and lead burns with a purple flame. When charcoal points are used and brought into near contact, a dazzling white light is given off (the electric

light); but no combustion, properly speaking, takes place. An extremely minute loss of weight only occurs, while the points become slightly increased in density. The phenomena are attended with more vivid brightness if the points are placed in vacuum, or in any of those gases which are non-supporters of combustion."—(*American Artisan.*)

To fasten the Handles of Knives, Forks, etc.—The *American Artisan* gives the following method for this purpose: "Procure some common yellow rosin and reduce it to a powder, and add to it about one-quarter or one-third of its bulk of common whitening, or very fine sand will answer the same purpose. When this is prepared, and it may be kept ready at hand, clean the knife or fork tang from the remnants of the old cement which will adhere to it, and also clean all dirt out of the hole in the old handle. Heat the tang moderately warm over the flame of a gas-jet or a lamp, and insert it in the mixture of rosin and whiting—a certain portion will melt and remain upon the tang; then thrust it into the place it is to occupy in the handle, withdraw it, and heat it again, plunge it into the rosin, let it hold all that will adhere to it, and then place it in the handle in the position you wish it to occupy, and let it remain until it is cold, and the cement is thoroughly hardened, when the handle will be found to be as strongly fixed in its place as when it was first put together."

Substitute for Steel.—"Bronze containing 10 per cent. of aluminium and 90 per cent. of copper is now employed by M. Hulot as a substitute for steel. In France the perforations in postage-stamps are produced by fine needles. Three hundred of these, in the Paris machine, act together, penetrating five sheets at a time and descending into holes, formed with great accuracy, in a plate beneath. This plate is made of steel and wears out in a single day; one made of aluminium bronze, and under an instrument making 120,000 blows in a day, it is said will bear 180,000,000 blows without requiring repair."—(*Amer. Artisan.*)

Extinction of Fires from Oil.—T. H. Swindells states, in the *Chemical News*, that "the sudden throwing of sand or any similar substance upon masses of flame proceeding from burning oil, etc., is generally sufficient to extinguish or choke them out.

"Some time ago I put out a fire, which might have destroyed an immense amount of valuable property, by simply dashing fifty or a hundred shovelfuls of slacked lime, which happened to be near at hand, upon the flames, which literally choked them out. The fire in this case was caused by a cask of oil being set on fire accidentally. This is only one of the many fires which I have seen put out by adopting the same means. I consider it would be a good plan if owners of such places as oil works, etc., always had at hand a quantity of sand, dry old lime waste, etc., which could be used in the manner I have stated when necessary."

"*Nitrate of Silver Stains, etc.*—Stains of nitrate of silver, or ordinary marking ink, may be erased easily by several agents. Chloride of lime in strong solution is a convenient and ready article, that converts the silver to a white chloride, which may then be removed by washing with ammonia, or a solution of hyposulphite of soda. If the stain be of

long standing, it may be necessary to repeat this process several times before it will be effectually discharged. Cyanide of potassium is excellent for decomposing the nitrate of silver, and will readily remove stains or marking. The cyanide of silver which has been formed, is easily dissolved in an excess of cyanide of potassium. Tincture of iodine is sometimes recommended; it is designed to produce the iodide of silver, which may be washed away by using the hyposulphite of soda; this method, however, is not to be relied on; it does not always succeed."—(*Drug. Circular*)

"*Cheap Glass-Cutter.*—Take an old three-cornered file, heat it red hot, and plunge it into a previously prepared mixture, of equal parts of snow and salt, stirring it about so as to cool it as quickly as possible. Then grind the point on a wet stone, preserving the three sides as nearly as possible, and it is ready for use. Lay the glass to be cut on a perfectly smooth surface, apply a thin flexible rule, and draw the point of the file quickly over the glass. A little practice will teach one how hard to bear on without fracturing the glass. To insure success it is needful to notch the edges of the glass at the extremities of the scratch. The file can be reground when it becomes dull. Such an instrument will be found serviceable for cutting glass for windows, and all ordinary purposes."—(*Ibid.*)

Hæmostatic.—The editor of the *Chemical News* states that "one of the best hæmostatic agents is said to be a mixture of perchloride of iron and common salt, dissolved in water. No free acid must be present."

Solder for Uniting Steel.—It is stated (*Ibid.*) that "silver solder is best for uniting steel together. Make it by melting together 19 parts of silver, 1 part of copper, and 1 part of brass. Use borax as a flux."

Cleaning Marble.—C. G. F., of La Grange, Ky., says (*Sci. Amer.*) "that a common solution of gum arabic is an excellent absorbent, and will remove dirt, etc. from marble.

"First, brush the dust off the piece to be cleaned, then apply with a brush a good coat of gum arabic, about the consistency of thick office mucilage, expose it to the sun or dry wind, or both. In a short time it will crack and peel off. If all the gum should not peel off, wash it with clean water and a clean cloth. Of course, if the first application does not have the desired effect it should be applied again."

"*Cement.*—J. H. McC., of Illinois, sends a recipe (*Ibid.*) for a cement which he finds useful for vulcanized rubber or 'anything else.' Take best glue 4 oz., isinglass 2 oz., and dissolve in mild ale, in a glue kettle, to the consistency of thin glue. Then stir in half oz. well boiled linseed oil. When cold it resembles india-rubber. It may be preserved in the form of cakes. When used it is to be dissolved in a suitable quantity of oil. It is an excellent cement for leather, earthenware, etc."

Rust removed.—Petroleum is said (*Ibid.*) to be very useful in removing rust from iron.

THE

DENTAL COSMOS.

NEW SERIES.

Vol. IX. PHILADELPHIA, OCTOBER, 1867. No. 3.

ORIGINAL COMMUNICATIONS.

THE PERMEATION OF ORGANIC AND OTHER FLUIDS.

BY PROF. RUFUS KING BROWNE,

PROF. OF EXPERIMENTAL PHY. AND MIC. ANATOMY NEW YORK COL. OF DENTISTRY; PROF. OF PHYSIOLOGY AND HYGIENE NORMAL SCHOOL OF PHY. CULTURE, BOSTON; FORMERLY PROF. OF PHY. AND MIC. ANATOMY NEW YORK MEDICAL COLLEGE.

It is well known that at various stages of the functions of different organs there is a direct passage of liquor from one portion to another of the organs. Thus, for example, from the stomach and bowels at certain periods there is a permeation of liquor, consisting of the soft and dense fluid products of digestion, through the side of the intestinal canal, into the blood and lymph vessels, which ramify in the thickness of its walls. So too, also, there is during certain periods a transit of fluid from the blood-vessels, ramifying through certain glands (for example, the salivary) into the ducts of the mouth. Phenomena of this character have been long mistakenly likened to those which were transacted between different fluids partitioned outside of the animal organisms. The whole two series together have been comprised as endosmosis and exosmosis.

If a glass vessel have a thin, upright partition of plaster of Paris through its centre, and on the right hand side brine be placed, and on the left pure water be poured, until the divided fluids are at one level, a flow is immediately established through the partition, and the brine will soon rise, while the clear water will lower in exact proportion. This is endosmose. The mixture of the two fluids, if the partition were removed, would be easily understood as one of the simplest of mere physical phenomena, and the only action of the partition is to graduate the rate of the flow, and thus allow the phenomena to be observed.

This is strictly true with substances having such large pores as plaster; but when an inanimate membrane is used the tissue of it seems to exert a more definite action. The change in volume of the side by side fluids depends on the difference of their properties. In mixable liquids this is

determined by their capacity for water, and acts the same between solutions of different density of the same substance, as between *different* substances. Solutions in water, of gum, gelatin, etc. increase in volume when opposed to water.

Each kind of matter has a tendency to diffuse itself through the pores or interstices of every other kind. And this tendency explains the solution of bodies. The various degrees in which this exists in different bodies accounts *in part* for many of the at first mysterious phenomena of physiology.

When a body is plunged into water it is either wetted or the reverse, according to its *capacity* for that fluid. If wetted, then its pores are saturated with moisture. This phenomenon is very simple, yet it is perfectly *analogous* to fundamental phenomena in the realm of physiology. This wetting is the first result of adhesion, or the first *intimation* of chemical affinity. That it is a result of chemical or physical affinity is shown by the fact that different substances act with different power. Thus while water will readily flow into the pores of chalk, mercury will not enter there at all, but is rather repelled. But while metals are really impervious to *water*, mercury will interpenetrate them.

Solids indicate various degrees of penetrability for water. A tube filled with glass, powdered very fine, will elevate water 170 millimetres, when the lower extremity is immersed in that fluid, while a tube containing glass, coarsely powdered, elevates it only 107 millimetres. This depends on the minuteness of the pores, by which a greater surface, and consequently a fuller action, is exhibited. It is evident that when the pores are large, the atoms of water occupying the central portion, do not come in contact with so large an extent of surface, and hence are not influenced.

This surface-action of the pores is well shown by the filtration of liquids. Salt water passing through a column of sand becomes fresh, but if the current be continued, it at length flows through unchanged; for after the surfaces of the sand-grains have attracted all the salt they can hold, they permit the remainder to pass unimpeded.

The exact reverse of this is obtained with some solutions, as carbonate of soda; the sand having a stronger affinity for the water than for that substance, the fluid flows out more concentrated than it enters.

The principle of the elevation of a fluid by a column of sand or powdered glass is the same as that of a capillary tube. The minute spaces or pores between the grains form a continuous, if tortuous tube, throughout their whole extent, up which the fluid is drawn. The height to which it will ascend is limited by the size of the pores, as in a continuous hollow tube. The fluid will not aggregate and flow from the surface, for the reason that they are thus drawn up and held by the attraction of the interior of the pore or tube.

The central portion is never so much elevated. The pressure of the atmosphere accelerates, but does not otherwise affect the ultimate height to which the column of fluid will ascend. The effect is the same in vacuo; nor does the hygrometric state of the atmosphere vary the result.

Elevation of temperature increases the height to which a fluid will ascend, and also the rapidity. Heat increases the energy of affinity. Warm liquids are more readily absorbed than cold.

When a colored solution is dropped on a piece of chalk the water penetrates into the pores of the chalk, leaving the coloring matter on the surface; and this is not because the particles of the coloring matter are too large to enter the chalk. If fluid mercury be dropped upon the chalk it will not be absorbed—it will not wet it; in other words, there is no affinity between the atoms of chalk and mercury. The phenomena here are the same as in capillary attraction; unless the fluid is capable of wetting the tube it will not be affected. Porous bodies, like tubes, imbibe fluids for which their atoms have attractions, and repel those for which they have not.

If an end of an open glass tube of small size be placed in water, that fluid will rise to a considerable height; but if the tube be placed in the mercury it will fail to enter, and will be depressed below its external level. Not only are fluids and gases absorbed by porous bodies, but they are peculiarly affected in the act. When the pores are extremely minute they exert a decided condensing influence, especially on gases. Spongy platinum, placed in a jar of hydrogen and oxygen, becomes bedewed with water produced by liquefying of these gases, *i.e.* their union. Spongy platinum condenses 252 times its own volume of oxygen, and then has become a powerful oxidizing substance. Prepared charcoal exerts so strong an attraction that it completely removes the nitric oxides from solutions of lead, tartar emetic, ammoniated oxide of copper, chloride of tin and zinc. Charcoal will absorb the *coloring* of almost all organic substances.

All bodies, even the densest minerals and metals, are permeable to fluids and gases. Water may be used as a partition between gases, and is found to be one of the most permeable of substances. The water of lake and river contains common air, but this air contains one-fifth oxygen; that of the atmosphere contains about one-third. It is from this richness of oxygen that aquatic organisms derive their support.

Solution is an imperfect form or stage of chemical affinity, in which change of form occurs without change of properties. If water be added to an alcoholic solution of camphor, the latter is at once precipitated, for the alcohol has a greater affinity for the water than the camphor, and when a solution of salt in water is treated with alcohol, the salt at once crystallizes at the bottom of the vessel, thus showing that both were held in solution by chemical affinity.

The line of distinction between capillary attraction and chemical affinity is indefinite. Hence Clairaut's formula, "if the attraction of the particles of a solid for those of a fluid is more than half the attraction of these last for each other, the solid will be wetted; but if it be less than half, the solid will *not* be wetted."

Capillary attraction is not only related to chemical affinity, but also to attraction of cohesion. When two pieces of lead, on being pressed surface to surface, adhere; when two plates of glass become attached, or when a plate of glass adheres to the surface of water, one and the same principle is involved. But in the passage of animal fluids through membranous tissue, it must *not* be inferred that the latter exert no power. On the contrary, they act on animal substances in a flowing state, with the most varied results.

The processes of absorption, secretion, and excretion, while they are illustrated by the *physical processes* we have described, to which they are strictly analogous, and while they moreover *involve* physical laws, exhibit a character which precludes our considering them *physical*, and which distinctly distinguishes them from, and elevates them above chemical proceedings.

Such is the history of the phenomena of endosmosis. They are a series which are *not physiological*, but which are dependent on physical laws and the physical properties and relations of substances. They bear no nearer relation to the phenomena of physiological transudation than the descending flight of a swallow or an albatross does to gravitation. Undoubtedly, both *alike involve* the existence of physical substances and properties, since, if the body of the bird had no *weight*, it could not descend; and so also the liquids and secretions of the body could not permeate vessels unless the fluids had physical properties. But these properties are not what constitute the heart of the phenomena, nor can they be alleged to explain them. The physical side of the phenomena are made strictly *subservient* to other and higher processes than they are capable of. The essential conditions of absorption in animate organisms are a cell-wall, whose composition is in great part water, and a fluid of animal substance. The products of digestion are animal substances in a flowing state, the composition of which, as food, was in large proportion water. This will pass through cell-walls or their interstices, not in virtue of the existence of defined passages or pores, but by displacing inwardly the particles of fluid already constituting a considerable part of the soft solid matter of the cell. Organic absorption commences and takes place in unison with prevailing organic actions. These are, the flow or progressive motion of the contents of the vessels that tend to draw into their own undisturbed current, soluble particles through extremely attenuate films of substance, interposed between fluid and current. Such films are cell-walls. This is demonstrated by the fact that the power of differ-

ent organs for absorption, depends on the number of vessels with which they are supplied, and the rapidity of the flow of their contents. *This* absorption, as in the case of the incoming of the products of digestion or soluble portion of food, is strictly *organic*, and is not to be induced under merely physical conditions; that is, where organic motions have come to an end, or where the tissues are exanimate. The readiness with which the fluid or watery portion of the contents of the blood-vessels will leave them and infiltrate the tissues when the organism is really exanimate, attests the existence of conditions during animation which *held* those fluids in their regular channel. The physiological refuses to be merged or swamped in the *physical* and *chemical*, while making both the latter subservient and ancillary to its own issues. The more we study the phenomena of each department, the more complete and inflexible becomes our assurance that the two latter phenomena are not convertible with the physiological. In view of a proper estimation of the facts, the ordinary and uniformly accredited designation of the ingress of oxygen into the capillaries of the lungs, and the egress of their carbonic acid into the air-vesicles, as a phenomenon of the diffusion of gases, seems far from the truth.

The carbonic acid gas is in combination in the contents of the blood-channels. Its last preceding state was its *entrance* by absorption into that combination. The process of the diffusion of gases cannot occur, according to the law of diffusion of gases, until it exists outside of the vessels, under its own form. *Then* it will diffuse with the gases of the air. But the truth we are to ascertain is under what *cause* of physiological phenomena it leaves the blood, holding it by a power which was sufficient to *draw* it into the volume of blood. It may be a fact that the blood holds *more* carbonic acid than it retains, and that its hold diminishes in the ratio of increase of quantity, but this presumed fact is not a specific explanation.

Neither, moreover, does the phenomena of endosmosis and exosmosis explain the phenomena; for it is not the mingling of two parted fluids, but of a gas in a fluid, and a gas entering a fluid. Between the fluid and the air these two gases do not mingle, nor come into the unison of association.

In organic processes, side by side, unseen, operate the causes of the building up and taking down of tissue, events of precisely and definitely contrary character; and that scientific ingenuity is futilely employed which seeks to institute in the philosophic mind the conviction that it is a physical law which effects the double transaction. The pride of the scientific mind may bask in the flattering assurance that it has presented an understanding of the phenomena, in citing physical law as the cause, but the phenomena steadily attest to the philosophic eye a peculiarity of power not included in physical phenomena. The chemist especially has

long had a bad and growing habit of comprising under the head of chemical many phenomena which he has as little right to regard as chemical, as he has the phenomena of gravitation or the flight of an albatross, or any strictly physiological event.

Undoubtedly even physiological events occur in the domain of physics, and involve substances of chemical character; but what constitutes the very character of these phenomena is, that these substances are exalted to the performance of processes so totally unlike any other they can take part in, except in *organic or living bonds*, so that the moment these organic bonds are broken down, these very substances, just now instinct with power, cease to be anything but passive and waste matter. Under these processes the very food becomes subject to changes totally novel to nature outside of the organism, and is exalted, when organized, to powers it was devoid of before it became a part of the structure of the organs. Even in the incidents of a mere physical character of endosmosis, and the permeation from one point to another through organized animal films, there is no similarity, but on the contrary a decided dissimilarity. In the tissues of the organism, hollows or channels, *airless* and filled to repletion, though capable of distention with soft, solid, viscid, or fluid substances, into which or from which the latter may pass through cell-wall or other limiting substance, there is no resemblance to fluids changing place or moving in obedience to atmospheric pressure, weight, hygrometric differences in state of their partitions, and all the merely physical causes of change pertaining to endosmosis. In the stages of the acts of organic absorption, there is no *interchange* of fluids, but a regular, and so far as we can now recall, an invariable transit *in one direction* from the vessels to the lymph lacunæ, and from the intestines into these, continuously into the chyle-vessels, and capillaries. From the former canal, supplied with flowing pabulum, consisting of food mingled with or combined with the gastric juice, which has liquefied it by, in one and the same process, acting on the food and combining with it in the act, through the epithelial coating of the villus into the blood-vessels coursing on the under side of that cell layer, or, *from* the blood-vessels under cardiac and arterial impulse, into the textures hermetically, closely surrounding the capillaries. The only *interchange* which can be claimed is of gases: first, of oxygen from the plasma or corpuscles into the tissues, and carbonic acid into the blood; and second, of oxygen from the air into the blood, and of carbonic acid from the latter into the air-vesicles. A distinguished physiologist, refusing to admit vital power, says: "Many operations which physiology once ascribed to vitality are now known to be due to chemical affinity." But even if these words were true, it was only because in our ignorance of the facts of the science, and the want of knowledge of sufficient series of them to prompt and enable us to *discriminate*, which the physiologist now does, between the physical,

chemical, and physiological, we did not place each in its own order; but this is a lesson to the chemist who is now constantly falling into this very error for chemistry. No action in the organism is merely chemical or simply physical, but being physiological it *in*volves both, and *pre*supposes an organism. But implying both, what is evolved, *i.e.* the characteristic *process*, is the physiological, and the latter we say is neither chemical nor physical.

In fact, there is no resemblance between the phenomena of osmose and absorption, and their cognate process, and what is taken for a resemblance is the patent fact that albuminoid fluids are *osmotic*. But this does not constitute, between the processes thus mistakenly likened, an identity of character. Although the ordinary designation of a vital force is erroneous, evincing, in fact, quite as little correct understanding of physiological phenomena as the predication of chemical force, it points far more properly to such an understanding than chemical laws and affinity can; for neither of these cognize any peculiarity in the processes of animation other than what pertains to matter and its properties, its actions and reactions; thus persistently sinking life into the merely physical, and denying the very character in which the former excels the latter. The simplest phenomenon of life, the mere division and multiplication by that process, of the cell, is a process which utterly ignores any chemical force.

POLISHING INSTRUMENTS.

BY M. L. PIERCE, ST. PAUL, MINN.

For many years I have sought in vain for a process whereby I could repolish a steel instrument by hand, which had originally been hardened and finely polished, and the polish destroyed by heating, to remove the temper, so that it could be fashioned into an implement of some other device. My former practice always was to polish with hardened steel and oil, or soap and water, which made a very uneven and unsatisfactory polish, and exhibited a great contrast between that and the portion polished with wheels at the manufactory.

But recently I had occasion to renew the points of a few very finely polished instruments, and in finishing I resorted to a new process, as follows:

Take a soft-wood stick, like cotton-wood or poplar,—the latter I use,—and dip it in soap and water, then in pulverized rotten-stone, and rub the instrument until you have removed all blackness consequent upon the heating of the instrument, and the finish looks fine and even. Then take another stick, free from grit, and dip first into the soap and water, then into jeweler's rouge, and rub the instrument until the polish is satisfactory.

The part to be polished should be stoned down, however, before the instrument is hardened, with fine Scotch stone, to remove all the file

marks. And if it should be rubbed with the sticks and powders, even before hardening, it would facilitate matters, and make the polish more perfect.

VASCULAR TUMOR.

BY J. S. SMITH, D.D.S.

Receiving an invitation from a medical friend to assist at an operation performed on a boy in April last, I deem it not out of place to give a brief account of it. The patient was a boy six years of age, of a bright, lively disposition, blue eyes, and fair complexion, with a vascular or erectile tumor springing from the periosteum of the socket of the inferior deciduous lateral incisor.

From what I could learn of the mother, in November last the boy's father undertook to remove this tooth by the aid of a string, occupying a half hour before the tooth was removed, lacerating and bruising the parts very much.

The tumor made its appearance soon after the tooth was extracted (or, in other words, twisted out), and continued growing until April last (about five months), at that time measuring about three-fourths of an inch from the base to the apex, and half an inch in diameter. Its structure was laminated, one stratum upon another, and presented very much the appearance of fresh liver. Prior to its removal there was little or no pain, but the teeth on each side of it were forced from their normal position, and posterior to it the permanent tooth had made its appearance. The patient was placed under the influence of chloroform and ether, and the operation performed with ease.

The hæmorrhage was profuse, but soon controlled by "Monsel's solution of persulphate of iron."

HOW TO WORK ALUMINIUM.

An esteemed correspondent sends us the following information in reference to the process for working aluminium:

Annealing.—As much as possible in a furnace, to a dark red only.

Refining.—Dip the metal in nitric acid, *pure* and warm; when it has attained a heat of 100 degrees, let it remain two minutes, then throw it in cold water. This refining renders it lustreless.

Aluminium cannot be soldered; there exists no solder for this metal.

Melting.—To melt, put the chippings in an earthen crucible, make it red hot, and beat with an iron hammer, to make the pieces adhere; then forge when cold, and pass through rollers to flatten.

PROCEEDINGS OF DENTAL SOCIETIES.

TRANSACTIONS OF THE AMERICAN DENTAL ASSOCIATION.

BY GEO. WATT, D.D.S.

Third Day.—*Morning Session.*

The clinic exercises were continued till 9½ A.M., after which the Association was called to order by the President.

The minutes of the afternoon and evening sessions were read and approved.

Dr. Lawrence read the report of the committee appointed last year to prepare a circular to the profession, with reference to the reception and education of students, which was accepted and adopted. As this report has already appeared in the journals, and by circular, it is not thought necessary to reproduce it here.

The President announced that the hour had arrived for selecting the place of the next meeting.

Dr. Shepard moved that we select the old camping ground, Niagara Falls.

Dr. Magill nominated Erie, Pa.

Lookout Mountain, New York, Mammoth Cave, Pittsburg, Detroit, Louisville, Saratoga, and Newport were, in turn, nominated.

Dr. Spalding objected to Niagara, because there were no daily papers published there. He thought it important to have the attention of the public called, to some extent, to our transactions.

Dr. Robbins, therefore, advocated the claims of Erie. It had daily papers, and various other advantages.

It was agreed to take an informal vote, and then select from the highest three on the list. These proved to be—Niagara, 48; Erie, 16; Louisville, 14. The vote was then taken, resulting in—Niagara, 54; Louisville, 23; Erie, 15. So Niagara Falls was selected for the next meeting; and the vote was made unanimous.

Dr. Allen then read a lengthy paper entitled "The Physical History of the Various Nations of the Earth, with special reference to the Teeth."

The paper stated—We are often asked two questions: 1. Are the teeth of Americans worse than those of other nations? 2. If so, why?

To answer these questions, he had found it necessary to make the researches detailed in the paper. And it was found that there are many nations on the earth whose teeth are sound—whose teeth are lost as rarely as their eyes. But in this country it is estimated that twenty millions of teeth are lost annually. And this contrast is found, notwithstanding the fact that the laws of nutrition are the same the world over, and while there is, everywhere, an abundant supply of the nutritive materials necessary to

the formation of good teeth. Indeed, there are but a few materials in the human body, and these are composed of the nutrient parts of the food, and the food of all nations contain them.

With proper research, historical evidence will always answer affirmatively our first question.

In England, among what are called the refined classes, the teeth are bad; while among the peasantry they are good. The difference in diet affords a sufficient explanation.

In Lesser Asia, where the diet is mainly milk, eggs, figs, etc., Hippocrates tells us they have fine teeth.

In Central Africa, north of the equator, the barbarous practice of filing the teeth prevails; but in other parts of Central Africa, where this is not done, we are told by Pritchard, the teeth are good.

The Nubians, according to Burkhardt, have simple habits and good teeth.

In the western portions of South Africa, the inhabitants are well made and have good teeth.

In different parts of Asia, where rice and other cereals constitute the principal food, the inhabitants have fine teeth.

The Tartars, according to Erhmann, are of middle stature, with oval heads, regular features, small eyes, nose and lips thin, with teeth strong and white.

Between Hindostan and China, the teeth are blackened by chewing a mixture of lime, catechu, etc., and present a very disgusting appearance.

Baron Larry tells us that in Eastern Arabia, the inhabitants have beautiful, white teeth. He tells us, also, that the Egyptians have large jaws, moderate alveoli, and fine, white teeth, and that they use but little animal food.

A missionary tells us that the inhabitants of the Society Islands are of middle stature; that they always have their complement of teeth, except in extreme old age, and that these teeth, though large, are very white—seldom discolored from any cause.

The New Zealanders vary in color from a deep orange to black, and there is a corresponding variety of features. The teeth are broad, white, and well set. One author tells us that in old persons they are much worn down, and have a peculiar structure, referring probably to the filling of the pulp cavities with secondary dentine. In districts where warm sulphur springs abound, the enamel is yellow.

In some of the islands of the Pacific, the inhabitants live principally on cocoa-nuts, banyans, etc.; and they are characterized by strong features, sharp noses, large, black eyes, large mouths, and fine white teeth.

The Fejee Islanders and the Australians were also described as having good teeth.

He quoted from "Morton on American Skulls," and from Capt. Cook

and others, to show that the native races of America have good teeth; but to follow him as minutely here as our notes would enable us to do, would lengthen our report beyond what is intended.

He next referred to the United States, where, he said, we have a mixed population, so assimilated in features and manners that the historian will notice us as one race; and how different the record of the jaws and teeth! How often we find contracted jaws overcrowded with deformed or badly developed teeth! And so terrible are the ravages of disease among these organs, that 20,000,000 are lost per annum!

Humboldt speaks of the peasantry of a mountain region having fine teeth, "like all nations that lead a very simple life." These peasants had not changed the proportions of nutriment in the "staff of life," as is done in the bolting of flour; but they used the entire grain. They had another advantage in plenty of out-door exercise, which enabled them to appropriate the necessary food.

He thought we ought to learn from the book of nature, thus spread out before us, and cease the disastrous practice of separating the mineral elements from our staff of life. But the results in the way of defective teeth were not so astonishing, he said, when we take into consideration the extent of the means and agencies employed in thus deteriorating the food. In 1860 there were 13,868 mills in the United States, employing 27,626 men, who received in wages $8,721,391. All this power and capital are employed in destroying the proper and natural proportion of nutrient materials in that which forms the chief article of our diet. And this is one of the most prominent reasons of the greater amount of dental decay found here, than is observable elsewhere. The potter cannot make a pot without clay; nor can the constitution build up bony tissue unless furnished with bone-making material in the food.

The paper, of which this is but a partial synopsis, was accepted, and referred to the Committee on Publication.

The report of the Committee on Operative Dentistry was called in order; but the committee was absent from the hall.

Dr. Flagg called attention to Morgan's plastic gold; said he had a new rôle to play, but he proposed to play it fairly. He was not here in the capacity of a huckster—not as a seller, though he had some gold to sell; but he proposed to sell it to members only for their good. He had no pecuniary interest in its sale. He claimed for this gold a practical uniformity of texture. The worst specimens he had seen, in a practice of five months, were almost as good as the best of other varieties.

As to manipulating it, even a tyro could make a good filling in less time with it than the best operator could with foil. He would not say "out loud" that an ordinary cavity could be properly filled with it in two minutes; but he would say, in a whisper, that it could be done in less time.

He claimed that it was purer than foil—was sufficiently hard, but filed and burnished much more easily than foil. The instrument for using it should not have deep, but open and definite serrations; and their condensing surfaces should be broader than for foil. He had instruments here for sale, which had been inspected and approved by Dr. Ellis, who was the agent for the sale of the gold, and who inspects the gold as well as the instruments.

[This report does but feeble justice to Dr. F.'s speech, which was very lengthy, and delivered with an eloquent earnestness. The rapidity of his diction is the reporter's apology for this defective effort at saving all the good points of the speech.]

On motion of Dr. H. A. Smith, a committee of three, consisting of Drs. H. A. Smith, Wetherbee and Allport, was appointed to investigate and report on the merits of all the varieties of gold for filling, to be found in the market, except foil.

Adjourned to 2½ P.M.

THIRD DAY.—*Afternoon Session.*

Met at 2½. President in the chair. On motion, four o'clock was set for hearing Professor Cutler's paper on the Microscopy of the Teeth.

The Committee on Operative Dentistry reported through Dr. C. R. Butler.

The report stated that operative dentistry includes much more than filling, pivoting, extracting, etc. As a preliminary to all prolonged operations, the mouth must be so treated as to render it comfortable to the patient, and bearable by the operator. Pivoting was now much less called for than formerly, but, when needed, should receive the greatest possible care. The root should be so filled with gold as to thoroughly protect it from decay.

The report noticed, at some length, the various improvements in filling teeth which had been recently adopted, and especially the different processes for keeping the tooth and gold dry while filling.

The paper was accepted, and referred to the Publication Committee.

Dr. Corydon Palmer read a paper on the Use of the Wedge in separating teeth. In general, he opposed prolonged wedging with rubber, or other materials, as annoying to the patient, and dangerous to the teeth. Teeth could be wedged apart, he said, at a single sitting, in a short time, without injury, and with but little pain. How to use the wedge was an important consideration. The common method, he said, was to introduce the wedge between the necks of the teeth to be separated, and drive it with a mallet to the desired extent. Instead of one wedge, he would use three or more. From watchmakers' pivot wood, used in its full length, he would prepare three wedges, the first comparatively broad and

thin, the second narrow and thin, the third narrow and thick. The first he would insert near the cutting edges of the teeth to be separated, and at a right angle with the long axis of the tooth. Number 3 he would insert between the necks, and number 2 between 1 and 3. He would depend mainly on number 1 to do the opening, on number 3 to hold what was gained in space by number 1, while number 2 would assist both. In molars and bicuspids, it was sometimes necessary to wedge from within as well as from without. The mallet is the proper instrument to introduce the wedges, and it should be sufficiently heavy to meet the requirements. Proper care should be taken not to introduce the wedges too rapidly. After two or three strokes of the mallet, time should be given for the tissues to adapt themselves to the new condition.

The paper was accepted, and referred for publication.

Dr. Taft said he did not feel willing to let this subject pass over without some notice of a speech this forenoon in regard to plastic gold. The intentions of the speaker were, doubtless, good; but they were certainly calculated to lead into serious error. The gold described, and the instruments for using it, were similar to what he had been familiar with for ten or twelve years. But the statement that any tooth can be properly filled with this gold in two minutes or less is calculated to do great mischief, if relied on in practice. He had failed to find anything approximating such speedy results. Haste, at the expense of efficiency, was very bad practice. Those very rapid manipulations are never very accurate.

Dr. Bogue approved of the use of crystal gold. To overcome excessive sensitiveness of dentine, he had tried sulphate of morphia, as recommended by Dr. Chase, but had no success with it. He had used, with advantage, a combination of acetate of morphia, creasote, and tannin.

Dr. Russel said, we know that soft foil saves the teeth; but we do not know whether this preparation of gold will or not. It has not yet had the test of time, by which all materials are to be tried. He uses cylinders, and, in completing the condensation, he drives in pointed pieces of gold wire. He objected to crumpling the foil, as practiced by many, as it took a long time to get it as well condensed as if laid in smoothly in the condition the goldbeater left it. To make a good filling, he said time was necessary. An amalgam filling could not be inserted in two or three minutes, nor in five.

Dr. Barker said he was sorry to hear the extravagant praise bestowed this morning on the plastic gold. The thing was so greatly overdone that prejudice against it would be aroused.

Dr. Walker was well pleased with Lamm's gold, but he didn't pretend to make "2:40 time" with it.

The President stated that the hour fixed for hearing Dr. Cutler's paper had arrived.

Dr. Cutler stated, by way of introduction, that he proposed nothing that any man may not do. The researches which are the basis of the paper had been conducted with a home-made instrument—one that he had made himself, in his own laboratory. His paper was entitled "THE MICROSCOPIC ANATOMY OF THE TOOTH."

He said he had stated, in a previous article, that a large molar tooth contains a hundred thousand nerve fibrils. He was ready to prove it. When the pulp is extracted, the nerve fibrils are broken off at the inner wall. They would be thus broken off even if they did not fill the tubuli, and were not attached to the interdental membrane. He maintained that no pain will be felt where nerve filaments do not extend, and the finer the filaments, the more acute the pain. The pulp, he said, was formed by a union of all the fibrils that ramify the dentine. Viewed as an opaque object, he said the fibrils might be seen perforating the pulp membrane, to go into the dentine. He knew that microscopists took issue with him on this, and, among them, his friend in Philadelphia; nevertheless, he had specimens and demonstrations that "laid him on his back." The great want of the dentist is an accurate knowledge of the minute anatomy and physiology of the tooth. To overcome this, dentists must rely on themselves.

He said there had been disputes about "interglobular spaces;" but there are no such things, though he, too, had been "fooled" with them, just like the rest. They are simply defects in mounting, and by the application of heat they may be made to assume various shapes after the specimen is mounted. In healthy pulp cavities, there is a colorless fluid that nourishes the tubuli by osmotic action. The dentinal tubuli do not anastomose at the interdental membrane.

The paper also gave a minute description of secondary dentine, and stated that an ossified pulp gave a better preparation for observing the nerve filaments with the microscope.

The paper was accepted, and referred to the Committee on Publication.

Dr. Spalding regarded it as the duty of dentists to settle these intricate questions for themselves. We ought to be self-reliant, and not wait for others to investigate these things for us. He was glad to learn, as he did from the paper, that we have a worker among us competent to settle this matter definitely. He hoped he would be furnished with all the aid and encouragement the profession can give him. We have had hitherto to rely on the statements of those outside of our profession for definite information on these points. Heretofore he knew of no one who had traced the nerve fibrils from the pulp through the outer pulp membrane. He had tried to account for the sensitiveness of dentine on the hypothesis that the nerve fibrils do not penetrate this membrane, or ramify through the dentine. But here was a new field opened up, and he was as ready as

any one to rejoice in the new light. He hoped he would now go on with more determination than ever to settle all these questions, and hoped all would be ready to yield to demonstrated facts.

Dr. Atkinson said that so little attention had microscopy received by our profession, we were scarcely able to furnish a decent committee from this association capable of judging of the merits of this paper. It was generic in its character, and unique in its nomenclature. He must be allowed to take decided exceptions to its nomenclature. Petrifaction and ossification are well-defined terms, and convey altogether different ideas. And he knew of no open mouths in any vascular system of an organized being. He claimed that the primary nerve cells have too great a diameter to enter the dentinal tubuli. He asserted that in living teeth there is no organic matter in the tubuli. To try to pass a nerve cell into a tubule, would be like putting an ox into a glass tumbler. He didn't remember their exact or even their relative diameters, but the ox and the glass were a fair comparison.

Dr. Kennicott asked if this statement was based on observation, or was it mere speculation.

Dr. Atkinson claimed that it was demonstrated by actual observation. He stated that we had no glasses fit for such observations till within the last ten years, nor had we enjoyed very good ones till within six years. He claimed that a calcified pulp does sometimes adhere to the walls of the pulp cavity. Every tissue has its specific cell. When seen isolated, it may be mistaken for a mere globule. The most perfect type of complete calcification of the pulp is to be found in the front teeth of the cow, and similar ruminating animals.

Dr. Fitch said it had been claimed by recent workers in microscopic anatomy that the nerve fibrils do not terminate at all—that the circuit is continuous.

The Nominating Committee reported the names of candidates for the several standing committees. On motion of Dr. Watt, the report was accepted, and made the order of the day for 10 o'clock to-morrow.

It was, on motion, resolved that a sum, not exceeding $100, be appropriated to aid the Publication Committee in hiring a proof-reader to assist in getting out the Transactions.

Adjourned to meet at 8 o'clock this evening.

THIRD DAY.—*Evening Session.*

Met at 8 P.M. The discussion on Dr. Cutler's paper was resumed.

Dr. Judd was glad to hear of microscopic researches being made by members of our profession. All papers, he said, are more or less defective. If this paper has defects, it becomes us to be very cautious about indorsing it, as the scientific reputation of the Association would suffer by doing so. He regarded the matter of nomenclature as very important,

and he objected to the statement that the generally received idea is that the blood corpuscles circulate in the dental tubuli. The paper would appear to read as if no research had been made heretofore as to the termination of the dental tubuli and their contents. Tomes saw filaments in the tubuli, but he did not risk his professional reputation by stating that they were nerve fibres. He (Dr. J.) believed them to be such, but not true nerve. We owe this knowledge to Tomes.

He believed in the existence of interglobular spaces; had seen them, even in specimens not mounted at all. He regarded them as abortive attempts to form *lacunæ*. He thought secondary dentine was oftener found in the centre of the pulp than elsewhere. He regarded it as perfect dentine.

Dr. Taft said that Dr. Cutler's paper was so much in accordance with his own views, and agreed so well with his own observations, as far as these had extended in this direction, that he was very favorably impressed by it. Perfection had not been claimed for it, either by its author or its advocates. He did not like the spirit of the first speech after the reading of the paper. There was certainly no call for the assumption that the author was behind the times, and that his observations had been made with the aid of defective glasses, especially when members know nothing as to what character of glasses are in his possession. Years ago he had come to the same general conclusions as to the distribution of nerve fibrils, not, however, from microscopic research. He was gratified to find his inferences sustained by demonstration in the hands of one so competent as the author of the paper under consideration.

He had not found secondary dentine to be "perfect dentine," as claimed by Dr. Judd. The tubuli were not well defined as in true dentine. Sometimes it resembles cementum more than it does dentine. He had examined many specimens, and had never seen regularly defined tubuli in secondary dentine obtained either from the pulp cavity or crown of the tooth.

Dr. Chase was astonished at the many new points suggested, and positions taken by the paper. He had specimens mounted and not mounted that show the interglobular spaces. Nor did he believe in the doctrine of open-mouthed vessels. He spoke of the necessity of being specific in the use of the terms *calcification* and *ossification*. By a simple deposition of the lime salts, as in calcification, a substance having a texture like glass may be formed; but that ossification may take place, there must be bone-corpuscles. He had seen "dentified" pulps.

Dr. Horton said we are familiar with the idea of nerves of motion, and nerves of sensation. He would inquire if there is any other tissue that can perform the functions of nerves.

Dr. Atkinson said, Yes! and illustrated by the gelatinous portion of the tooth doing so in "toothedgedness." By the action of acids, the "neural ghost" is offended; and the offender is driven out by an alkali.

He mentioned several precautions necessary in preparing and mounting sections of dentine for microscopic examination. The albumen in dentine would be coagulated by atmospheric air alone, hence a section cannot be properly prepared dry. The dentinal fibrils, he claimed, are coagulated *liquor sanguinis.* By splitting a section, and separating the fragments, the fibril may be observed without its being broken off; and he regarded it as a *post-mortem* body.

[This was perhaps the longest, and certainly the most animated speech of the meeting. Does the reader then ask, why such a meager report? Let a leading phonographer answer: "Our pencil, sharpened though it was for the shortest of shorthand, could not catch the rapid utterances of the speaker."]

Dr. Judd wished to say, in reply to Dr. Taft, that in his remarks on the paper he meant nothing personal. He was simply not willing that all the statements of the paper should go abroad as indorsed by this Association. He had intimated that, in some respects, it appeared to show a want of familiarity with modern scientific research.

Dr. Watt said there need be no sensitiveness about responsibility, as the Constitution requires the Publication Committee to prefix a disclaimer to the published transactions.

Dr. Cutler said if the paper was made up of old fogy ideas, he wished the gentleman to give him a list of the authors that will teach him better. He was well pleased with the reception his paper had met. He wanted it *sifted*—not as Dr. Allen's paper tells us flour is sifted so as to take all the best out of it, but as wheat is sifted to remove the chaff. He had spent three months in the examination of the pulp nerve, and felt that his labors had only begun.

Dr. Taft said he had seen the fibrils, and believed they performed the function of nerves. He did not regard the oscillatory theory as satisfactorily accounting for the sensibility of dentine.

Dr. Barker was a believer in the existence of the interglobular spaces, and a disbeliever in the open-mouthed vessels referred to in the paper.

Dr. Spalding said he would not defend the paper. Its author was fully competent for that duty. The statement as to the contents of the dentinal tubuli was new to him. He had held that, in the living tooth, they were filled with a fluid. Contact with the nerve matter, he said, was not necessary to sensation, as is proved by our being able to feel through the cuticle. He believed nerve force was convertible into other varieties of force—that it is not an exception to the law of correlation. He had favored the undulatory theory; but, if the other is demonstrated, he was ready to change.

Dr. Wetherbee said Dr. Spalding's theory of undulation and correlation was plausible, but not sound. Suppose the pulp to be completely

ossified, and the deposit as sensitive as nerve itself. Whence this sensitiveness on the oscillatory theory?

Dr. Spalding had not seen such cases.

Dr. Wetherbee had seen such. He had also seen a portion of the pulp alive while the canal between it and the apex of the root was completely sealed up by ossific deposit.

Dr. Flagg said he believed in the undulatory theory of the action of nerve force, and said that the motion in (or of) the calcific deposits might explain the pain in some of the cases just referred to. [This speech was long and animated; but as the doctor was beyond the hearing of the reporter, its eloquence is lost, so far as this report is concerned. This we regret, but could not prevent.]

Dr. Cutler said the question now seemed to be whether a fluid or nerve tissue filled the tubuli. He examined the wave theory at some length, and gave minutely the anatomical structures of the ear and eye, showing their perfect adaptedness to this theory. Now, said he, is there anything analogous to this in the structure of the tooth?

On motion, adjourned till 9 A.M. to-morrow.

Fourth Day.—*Morning Session.*

The question was raised as to whether the annual dues are to be paid by absent members, when it was found that the Constitution had been so amended, at the Niagara meeting, as to require payment from all. This meeting occurred in 1864; and the Treasurer was instructed to collect back dues accordingly.

Dr. Dickerman gave notice that he would, at the next meeting, propose an amendment to the Constitution, making non-payment of annual dues for more than one year a forfeiture of membership.

Dr. French offered the following resolution:

Resolved, That this Association hereby offers a prize of $5000, which will be paid to any chemist or experimenter who shall invent, for the use of the dentist, a perfectly plastic material, that shall be in every respect equal to gold as a filling for decayed teeth, and shall more nearly approximate the teeth in point of color, said prize to be raised by assessment on the members of this Association, and to be adjudged and awarded by a vote of the same.

After some discussion, the resolution was laid on the table.

The subject of Operative Dentistry was taken up. Dr. Atkinson said this was the most important department of dental surgery; and the most important point of it is *diagnosis.* More mischief and more failures result from inability to recognize the morbid conditions than from any other cause. He referred to cleaning the teeth; and said, how few know how to do it! And how few appreciate its importance! It should be thoroughly impressed on every one that *teeth perfectly clean cannot*

decay. In all operations on the teeth they must be fixed so that they can be kept clean. This, he said, was too often overlooked. He regarded floss silk as an important, and almost indispensable article in keeping the teeth clean. As an illustration both of the importance and the capabilities of operative dentistry, he referred to the practice of a member present (Dr. Morgan). In a practice of fifteen years, in his present locality, he knows of no patient wearing a plate, who came under his care, with teeth, previous to their twenty-fifth year.

He spoke of wedging, and opposed the old way of keeping a wedge between the teeth ten days at a time. It was quite practicable, and much better, to do the necessary wedging at a single sitting. He compared wooden wedges and rubbers, regarding the latter as highly objectionable, death of the dental ligament, if not the periosteum, being a frequent result of its use.

The preparation of the cavity, he said, was very important. He had no confidence in any one filling tortuous cavities properly. They must be thoroughly opened up. Nor had he any confidence in two-minute fillings. He could show anybody how he thought a cavity should be prepared; but he could not satisfactorily describe the process.

Dr. Spalding said that in filling with cylinders he used adhesive foil. This, he was aware, was not the common practice. Others had told him they had difficulty using it in this way; but he thought they could overcome the difficulties. He thought all would agree that adhesive foil is preferable to non-adhesive.

Dr. Morgan said *opinion was not fact.* Fillings made of non-adhesive foil have lasted longer than any others. It was a mistake to infer that adhesive foil is purer than non-adhesive. Purity is not essential to adhesiveness, as foil may contain six per cent. of alloy, and still have this property. He had not found adhesive foil as soft and plastic as non-adhesive.

Dr. Wetherbee said he would differ with both the preceding speakers. He would reject the cylinders, as he could have his gold in a more convenient form, saving time in the preparation. He was satisfied that a "soft foil filling" will not last as long as a welded one. He was aware that non-adhesive foil is as pure as adhesive. He prefers the adhesive for extreme cases; and if better for these it is better for any cases; and he thought it required less skill and ability on the part of the operator. He prepares his foil by rolling it into a rope and cutting it into pellets. He anneals to a "cherry red;" and, when asked what kind of a cherry, he said that the phrase "cherry red," when used in reference to annealing or tempering, always means the color of the *wood*, not the *fruit.* This explanation appeared to be new, though satisfactory, to many of his hearers. He claimed that alloyed foil is hardened by annealing.

For the margins of cavities he preferred foil to crystal gold. He had noticed, in one of the journals, something about letting in the sunlight

to expel the swamp angels from dead pulps. When the pulp inflames after filling, and there is too much pain to admit of the removal of the plug, his practice was to drill into the pulp cavity to relieve the pressure, and afterward to remove the pulp, treat and fill. He usually removes the pulp in twenty-four hours after the application of arsenious acid, arrests the hæmorrhage, and fills immediately. He objected to the insertion of cotton into the canal. He regarded the practice as an acknowledgment of lack of ability, and something else. When the pulp is but slightly exposed and healthy he covers it with oxychloride of zinc, and when this hardens he trims it to please him, and fills the rest of the cavity with gold. He was not aware of having made any failures in this practice.

Dr. Black had followed similar treatment and practice in cases of exposed pulp, but had found so many dead ones afterward he had changed his course.

Dr. Shadoan thought Dr. Wetherbee's inference, as to the success of this mode of practice, was drawn from the observation of too few cases to be conclusive. Many men go through battle without being shot; but, that does not prove that it is safe to be shot at. As to annealing gold, he thought that it was not usually done with sufficient care. In endeavoring to temper steel broaches in the spirit flame, they are sometimes burned, and if not, are likely to be left as hard and brittle as ever by cooling too suddenly. But if they were heated in a piece of gun-barrel to the proper temperature, and allowed to cool before removal, they would be found almost as tough as threads. The same properties, to a less extent, are present in gold. When annealed in the flame of a spirit-lamp, parts of it would often be found hard, and inclined to work into balls under the plugger. Though not agreeing with all that the preceding speaker advocated, he agreed with him in preferring adhesive foil. His success in filling over exposed pulps had been rather satisfactory. Probably not more than one in fifty of the cases came back to him as failures; but that was not proof that none went elsewhere. Six months ago he had, in a few cases, tried the form of cap recommended a few years ago by Dr. Rogers, of Utica. They are good yet; but the time was too short to claim success.

Dr. Wetherbee said his reasons for adopting the oxychloride of zinc as a cap were, that it can be applied with less pressure than any other substance, was porous, and adhered to the walls of the cavity.

Dr. Morgan said he wished to notice two or three points. The softest foil will make a plug that will wear equal to enamel. Soft foil plugs have lasted longer than adhesive foil has been known. Adhesive foil is harder than non-adhesive, and, therefore, requires a stronger pressure to adapt it to the walls of the cavity. Serrated points were regarded as necessary in using adhesive foil. With these it was impossible to have the mass as compact as is obtained by using soft foil and smooth points.

Dr. Kennicott said that, as to relative compactness, there need be no difference. He objected to serrated instruments, even for adhesive foil. He had made a point of this, in the report on Operative Dentistry, at the Boston meeting. He had there claimed that the welding principle, and not mechanical attachment, should be relied on. In welding we bring the particles into actual contact. When foil is perforated by serrated instruments, masses of it may be held together mechanically without being welded. He described a plugger which he regarded as valuable. Instead of serrations and points—that is, definite points and angles—the condensing surface of the instrument is twice bisected with a small round file, the bisections being at right angles with each other. Four projections will be thus formed. These are to be rounded and smoothed, the whole condensing surface of the instrument being made smooth like a burnisher. Different sizes, and having different angles with the shaft of the instrument, may be prepared. This instrument is used with undulatory and rotary motion, combined with direct pressure. He uses this form of instrument in welding adhesive foil, and greatly prefers it to serrated points. In addition to the ordinary precautions to keep the plug dry, he kept it warm by heating the pellets as he introduced them. When the plug was a few degrees warmer than the mouth the vapor of the breath would not be condensed on it. Gold, he said, should be freshly annealed, to drive off gases and vapors which condense on its surface.

Dr. Cutler inquired what gases condense on the surface of gold.

Dr. Kennicott said he did not know.

Dr. Watt answered, whatever gases were present in the atmosphere, and the most condensable in the greatest abundance. In this city, sulphuretted hydrogen, ammonia, etc., would be found prominent.

Dr. Kennicott resumed, stating that he had found, by experience, that foil exposed for half an hour needed reannealing. In regard to capping exposed pulps, he was glad to see evidence of advancement. It had been a common practice with him for eighteen years. The course had been, with this operation, to venture, then fall back, and again advance. Now he thought the best practice was becoming generally recognized. His plan was, in general, a rigid cap for an arch over the exposed point, and a plastic non-conductor in absolute contact. Pure gold and gutta-percha fulfilled these indications. He had faithfully tried the oxychloride of zinc, but preferred gutta-percha.

Dr. Butler said that the instrument described by Dr. K. was about the same as one with shallow serrations. He said when gold is absolutely dry it can be welded with a burnisher; but as we cannot have it absolutely dry in the mouth, we must have instruments to break its surface in condensing. He had found it more difficult to weld gold in the atmosphere of Cincinnati than in Cleveland.

Dr. Kennicott thought his instrument was essentially different from a

serrated one. Rotary motion, he thought, would be impracticable with a serrated instrument. It was an important means of condensation with the one he described.

Dr. McClellan said that if the curves were changed to angles on the condensing surface of Dr. Kennicott's instrument, it would be similar to his favorite pattern. He favored the use of crystal or sponge gold. In cases of recent and slight exposure of the pulp, he applied dry oxychloride of zinc over the exposed point, capped over with the oxychloride as ordinarily used, and filled with gold. It had this advantage over other materials for caps, that it adheres to the walls of the cavity.

Dr. McKellops asked how Dr. Kennicott would apply his instrument in posterior proximal cavities.

Dr. Kennicott said he would open the cavity so freely as to make all parts of it accessible. And while on his feet, he would inquire of Dr. Wetherbee how it is, if annealing hardens alloyed foil, that it softens alloyed plate?

Dr. McKellops alluded to Dr. Arthur's mode of serrating pluggers, by scratching them with a file. Such pluggers leave no "rat holes" in the plug. He uses both varieties of foil. He was very particular to get his foundation right. He usually begins with a cylinder, without a retaining point. The wedge and rubber dam were important in keeping the cavity dry. He uses Lamm's gold, in connection with pellets and cylinders, using foil for the borders of the plug. Absolute dryness in the mouth, he regarded as impracticable. He thought a patient could not endure a plug hot enough to prevent the condensation of moisture on it. He opposed filling immediately after the removal of the pulp.

Dr. Taylor said he was more than ever confirmed in the idea, long entertained, of writing out his views on filling teeth, and especially his early experience in block, or cylinder filling. He rolled his gold with pliers, or tweezers, into cylinders, and was having a convenient instrument constructed for making the cylinders when Dr. Clark introduced the broach. At an early day, from the necessities of the case, he had made an instrument very much like that described by Dr. Kennicott; and his mode of introducing the gold was about the same as that of Dr. McKellops. When practicable, he makes an inclined plane at the cervical wall, in proximal cavities, and builds against this, the tendency of pressure being thus to incline the gold inward rather than outward. He objected to serrated instruments, as they tended to produce porosity of the filling, and consequent loss of the tooth.

On motion, adjourned to $2\frac{1}{2}$ P.M.

FOURTH DAY.—*Afternoon Session.*

Met according to adjournment. President in the chair.

The Nominating Committee reported the following nominations for the standing committees:

Committee of Arrangements.—Drs. Geo. B. Snow, B. T. Whitney, and A. P. Southwick, of Buffalo, N. Y.

Committee on Dental Pathology and Surgery.—Drs. W. H. Atkinson, C. P. Fitch, E. A. Bogue, New York City; J. F. Flagg, Philadelphia; E. H. Kilbourne, Aurora, Ill.

Committee on Dental Physiology.—Drs. George T. Barker, Philadelphia; A. Hill, Norwalk, Conn.; J. McManus, Hartford, Conn.

Committee on Dental Chemistry.—Drs. H. S. Chase, Iowa City; A. B. Robbins, Meadville, Pa.; I. J. Wetherbee, Boston, Mass.

Committee on Dental Education.—Drs. H. Judd, St. Louis; G. W. Keely, Oxford, Ohio; D. S. Dickerman, Taunton, Mass.

Committee on Dental Literature.—Drs. M. S. Dean, S. B. Noble, J. A. Kennicott, Chicago, Ill.

Committee on Dental Histology and Microscopy.—Drs. S. P. Cutler, Holly Springs, Miss.; Geo. S. Allan, Newburg, N. Y.; J. H. McQuillen, Philadelphia.

Committee on Operative Dentistry.—Drs. J. C. Ross, W. H. Morgan, Nashville, Tenn.; W. T. Arrington, Memphis, Tenn.

Committee on Mechanical Dentistry.—Drs. B. T. Spelman, Warren, Ohio; A. W. Maxwell, Gallion, Ohio; C. H. Harroun, Toledo, Ohio; W. C. Dunn, Delaware, Ohio; N. G. Lewis, Buffalo, N. Y.

Committee on Prize Essays.—Drs. A. W. French, Springfield, Ill.; James Taylor, Cincinnati, W. W. Allport, Chicago; W. C. Horne, New York; A. S. Talbert, Lexington, Ky.

Committee on Voluntary Essays.—Drs. P. G. C. Hunt, J. F. Johnston, Indianapolis; Corydon Palmer, Warren, Ohio.

Committee on Dental Therapeutics.—Drs. C. R. Butler, Cleveland, Ohio; W. O. Kulp, Muscatine, Iowa; A. P. Sayler, Lyons, Ohio.

Committee on Publication.—Drs. J. Taft, A. Berry, H. A. Smith, Cincinnati, Ohio.

Your Committee beg leave to submit the following resolution as a part of their report:

Resolved, That the Committee on Publication of 1866 be, and they are hereby requested to complete the work now in their hands at as early a period as practicable. Believing that the appointment of a special committee of three, to receive and take care of articles presented for examination and exhibition at our annual meetings, would relieve the standing Committee on Mechanical Dentistry of a part of their arduous duties [see Section 6 of Article 6], we would respectfully recommend the appointment of such committee at this meeting, for the ensuing year.

All of which is respectfully submitted.

H. R. Smith,	A. W. French,
B. T. Spelman,	T. L. Buckingham,
J. F. Flagg,	Jos. Richardson,
D. S. Dickerman,	J. C. Ross.
H. E. Peebles,	

The report was accepted and adopted.

In accordance with the resolution from the Nominating Committee, the Chair appointed the following *Committee on Appliances:* Drs. L. D. Shepard, Salem, Mass.; E. A. Bogue, New York; J. R. Walker, New Orleans.

On motion of Dr. E. A. Bogue, it was

Resolved, That it is the duty of each member of the Standing Committee to make an individual report, so far as such report can be made, and in case of inability to be present at the meeting where that report is due, to forward it to the Recording Secretary, from whom it can be obtained by the chairman of each committee respectively, at the time of assembling of this Association.

The President announced that the special order for this hour was "The rubber dam," to be explained, applied, and illustrated by its inventor, Dr. Barnum, of New York. The general principle of this appliance is as well understood by the profession as it could be by any description of ours here; but the practical details of its application, as demonstrated by Dr. B., appeared to give great satisfaction to the members.

The report of the Committee on Dental Education was read by Dr. Spalding.

The committee reported gratifying evidence of increased prosperity in reference to professional education. Since our last meeting a new college has been established in St. Louis, which increases the number to six in the United States. Also an association has been formed designed to include the faculties of the several colleges, which aims to advance the cause of professional education by concert of action, and an elevation of the standard of acquirements on the part of candidates.

The importance of extended and accurate education was insisted on in the report. If knowledge is power, ignorance must be weakness, and the power cannot be wielded till it is possessed.

An onward step was suggested, and in the opinion of the committee, the sooner it is taken the better, viz.: that of requiring a just possession of the title of D.D.S. as a condition of membership in all our societies. As we have now no standard of professional attainment, we need not expect the public to establish one for us. As we do not discriminate, it is hardly reasonable to expect them to. That protection which we can throw around ourselves, by a proper discrimination, will be found much better than legislative protection, as sought for in some States, which is desirable enough, but not to be expected till we better protect ourselves in the manner suggested.

The report argued clearly, and at length, in favor of proper and thorough preliminary education. It expressed the opinion that there is

in the profession, as a general thing, a feeling of satisfaction with the general plan of our dental colleges, the friends of these institutions wishing to add minor details and improvements, rather than to change their general features.

The question of substituting instruction in medical for that in dental schools was considered at some length, clearly demonstrating the necessity of specific instruction, with reference to our own specialty, which can be obtained only in our own colleges.

The report defines "dental education" to be "that joint education of both the head and the hand requisite to constitute a finished dentist, and to fit him for the highest practice of his art." And this, the committee believes, can be obtained only inside of our own ranks. While literary institutions may make scholars, medical schools physicians and surgeons, only dental colleges, pure and simple, can meet the present demands of our growing profession.

A few of the defects of our present system of education were alluded to. One, that should be promptly remedied, is assigning too many studies at once; and another is expecting equal progress, regardless of mental capacity or previous attainment. A reduction of the number of studies simultaneously pursued, and an extension of the period of pupilage, were suggested as improvements.

The report was accepted, and referred to the Publication Committee.

The report on Mechanical Dentistry was submitted by Drs. I. A. Salmon and Corydon Palmer, members of the committee. They reported but little change in this department since last report. No new inventions or discoveries since that date have been sufficiently tested to warrant general adoption. Reports of experiments with aluminium, and with a composition intended to supersede rubber, are in circulation. In regard to the latter, a letter of inquiry by the committee failed to elicit an answer. The report commends continuous gum as still the highest style of our art for full sets, speaks of combination work (of gold plate with vulcanite attachments), and recommends Dr. Dunn's recent improvement in porcelain base as calculated to supersede rubber for full sets.

The report was accepted, and referred to the Publication Committee.

Dr. Herriott reported a case of a soldier who, at the battle of Mission Ridge, was struck with a fragment of a shell, which tore away his nose and most of his mouth. He was left for dead, but after he had revived, and reaction had been established, his cheeks were cut loose from their attachments, and brought forward, and a nose was formed by taking the necessary tissues from the forehead, but this proved a failure, on account of erysipelas ensuing. He exhibited a photograph showing the appear-

ance of the patient when he came into his hands, which was as ghastly as can well be imagined. He made for him a vulcanized nose and upper lip, combining with the latter an artificial moustache. The artificial piece is held in place by a rubber ligature and a pair of spectacles. He exhibited a photograph of his present condition, showing an appearance so natural as to enable the gentleman to go into society without attracting special attention.

Dr. Dunn described his recent improvement in "porcelain base." The teeth are moulded and "biscuited," then adapted to the mouth and body for the plate, the whole piece being baked together. This gave a more natural expression to the teeth than could be obtained by carving, and he claimed as full control of the position of the teeth as is possessed with continous gum-work. Dr. Dunn is secured by letters patent.

Dr. McClellan spoke of his having introduced the wire-gauze plate. Now he was experimenting with a new material, or composition, from which he hoped for good results. He would exhibit specimens, to show what progress he was making, but was not yet ready to answer questions, as his experiments were by no means completed. The specimens which the doctor exhibited were very light and smooth, approximating a gum color, and the teeth and plates appeared to be firmly attached.

Dr. Atkinson spoke of a composition plate, gotten up by Dr. Colburn, of New Jersey. He supposed it was from him that the committee had failed to get an answer. He said it was composed of vegetable gums and metallic oxides.

Dr. Kennicott reported three cases of mercurial ptyalism since our last meeting, caused by wearing rubber plates.

Dr. Fitch showed specimens of the material used by Dr. Colburn in making plates. Dr. C. is protected by two patents. It can be made in three hours; sticks to the teeth, so that pins are not necessary; may be used in fastening teeth to metallic plates. Dr. F.'s only fear in regard to it is lack of strength. Dr. Colburn proposes to sell the material rather than office rights, but will sell the latter when desired.

Dr. Gibson described a method of uniting the teeth and plate by vulcanized rubber, which had been suggested to him by looking at his wife's nutmeg-grater. He uses it for temporary work. When his gold plate is properly swaged, he lets it rest in the counter die, and with a triangular-pointed steel punch, he makes holes through it, around the border, as far as he wishes the vualcanite attachment to extend. When the teeth have been fitted as usual, and the piece packed and vulcanized, the rubber will be found to have penetrated these holes, firmly retaining the teeth in position. He thinks the profession do not properly appreciate continuous gum-work. While it is recognized by all as the highest style of art, how few use it!

Dr. Barker said it would be supposed that there was no one here who

uses rubber; but dealers had told him that they still sell that kind of teeth. He doubted the ptyalism, reported by Dr. Kennicott, having been produced by rubber plates. The vermilion, used in coloring the rubber, was not soluble in the fluids of the mouth. He had no interest in the rubber. Though overtures had been made to some of them, they were *above being bought.* (A voice.—"Ought to have been above suspicion.") The ptyalism of the patients referred to by Dr. K. may have been the result of mercury taken twenty years ago.

Dr. Allen said his ambition had been unbounded in this department of dental surgery, and his reward, in dollars and cents, was considerably less than nothing. He then gave a concise lecture on the various points to be observed in adjusting an artificial denture, explaining the whole process with his usual clearness.

Dr. Sill asked a brief indulgence, that he might report a case not pertaining to mechanical dentistry. On the 2d of July he extracted fourteen teeth for a lady. On the 5th of the same month her babe, four months old, died. The physician in charge reported the case as a death from using nitrous oxide.

Dr. McKellops exhibited and explained an ingenious method of inserting pivot teeth, illustrating with a specimen. The plan is the invention of Dr. Garkey, of Memphis. Having been interrupted at the time, we are not able to give a satisfactory description of the process.

Dr. Osmond, not being a member, was, on motion, allowed the opportunity to describe a case in which he had applied an artificial velum, for the relief of cleft palate. He had made the anterior portion of hard and the posterior of soft rubber. The result is satisfactory.

Dr. Harroun, who had given special attention to cleft palates, being called on, said that he and Dr. Bogue had never met before, but they found, on comparing notes, that they had been traveling the same road. They would endeavor, jointly perhaps, to lay their views before the profession. He described some of the important steps in constructing an artificial velum, which cannot be fairly reported here. An important one was that the margin of the posterior portion should be so flexed as not to present an edged border to the soft parts.

Dr. Bogue said that when the principle is well understood, it is not much more difficult to make an artificial velum than a set of teeth. He reported a number of cases, by way of illustrating the various difficulties and results. He agreed with Dr. Harroun, that in some cases the speech could be only partially improved, while some patients speak with a good degree of distinctness in spite of the cleft.

Dr. Atkinson inquired if he would adapt an artificial velum when the fissure affected only the soft palate; to which he answered affirmatively, adding that such were the easiest cases.

Dr. Shadoan described a method of making gold-work. Use twenty

carat plate, and roll to number 30 of the American gauge-plate. Swage accurately, and cut out a central portion the size and shape desired for the air-chamber. Reswage, to insure accuracy. Antagonize and adjust the teeth to the plate, using the rubber block-teeth. Then get a correct impression of the margins of the gums and the edge of the plate. Swage, adapt and solder on a gold rim, number 35, of the same gauge-plate. Replace the teeth and wax, trim the wax inside to the proper shape. Then make a mark in the wax, from heel to heel of the plate, about an eighth of an inch from the crowns of the teeth. The counterpart of this mark, in the plaster model, will be a guide in cutting the plate to be described. Next fill up with wax the cavity cut out of the plate already fitted, letting the wax extend slightly over the margins of the plate. Then take a plaster impression of the inner surface of the teeth and plate, as thus waxed. Prepare dies, and swage a number 32 plate to correspond. Trim and adjust, making the posterior corners come accurately in contact with those of the outer rim. Remove the teeth and wax, and solder the two plates together, first at their posterior margins, then carefully all around the air-chamber, which must be thus made thoroughly air-tight. While soldering on the inner part of the lining-plate, a small platinum wire should be bent and placed just inside of the lining-plate. When the soldering is completed, replace the teeth, and hold them in position with wax. To make the mould, invest so as to cover the outer surface, allowing the plaster to extend over their cutting and grinding surfaces. When the mould is ready, remove the wax, pack with rubber, and vulcanize. This work will be found quite stiff and strong, is very neat, and is easily repaired. A new block can be fastened in place with Wood's fusible alloy.

Dr. Spalding moved that the reports be all received and read, to-morrow, before discussion on any of them be allowed. Carried.

Adjourned till 9 A.M. to-morrow.

Social Entertainment.—By special invitation of a number of dentists of the West, the members of the Association, with their friends, including a goodly proportion of fair ladies, as well as members of other professions, convened at Hopkins' Music Hall, to participate in the pleasures of a social entertainment. As all the other evenings had been devoted to professional, it was, perhaps, profitable, and certainly pleasant, that this should be dedicated to social science. The entertainment was no discredit to Cincinnati, nor to the profession in the West.

After a satisfactory indulgence in the luxuries of the repast, a feast of reason was enjoyed in responses to the following sentiments:

"The American Dental Association." Responded to by Dr. A. Lawrence.

"Our Local Societies." Response by Prof. C. W. Spalding.

"Our Dental Colleges." By Prof. H. Judd.

"Our Dental Literature." By Prof. J. Taft.

"The Medical Profession." By Prof. C. B. Chapman.

"Medical Specialties." By Prof. E. Williams.

"The Clergy." By Rev. H. D. Moore.

"The Press." By J. D. Caldwell, Esq.

"The Ladies." By Dr. W. H. Atkinson.

The speaking, on this occasion, was decidedly good—as usual, a little too tedious; but it is difficult to say pleasant nothings briefly.

FIFTH DAY.—*Morning Session.*

Met at 9 A.M. President in the chair.

A dispatch from Dr. Allport was read by the President, stating that Dr. Wilson, of Chicago, was severely hurt, and Dr. Crouse slightly, by a railroad accident, and that "the rest of our party are all safe."

The minutes were read and approved.

On motion of Drs. Stockton and Sill, the thanks of the Association were tendered the dentists of Cincinnati and vicinity for the entertainment of last evening.

The report on Dental Physiology was called for. A paper from the chairman, Dr. J. Smith Dodge, Jr., was read, in his absence, by Dr. Spalding.

The paper stated that the committee found their department hemmed in on either side by corresponding committees on Histology and Pathology. The past year had developed nothing new in this department calling for special notice in a formal report. A brief statement of facts already recognized, and hints as to the direction of future research, seemed to be all that was left for the committee. The paper then went on to give a concise view of the researches and discoveries of Tomes in the department of dental pathology. We will not attempt to follow the committee here, but will refer the reader to the writings of Tomes, and to the report itself, as it will appear in the published transactions.

The report was referred to the Publication Committee.

Dr. H. S. Chase, another member of the committee, read a lengthy paper, which was disposed of in the same way.

Our notes do not enable us to do justice to this paper, and hence the reader is referred to the volume of transactions soon to be published.

Dr. Chase also read another paper, on the Shedding of Teeth. He claimed that absorption is a vital process; that it does not take place in dead teeth. The term absorption, he said, was used somewhat indefinitely. The absorption of dental tissue he regarded as a retrograde physiological process. On extracting the temporary tooth we see the root shortened. There is a change in the alveola-dental periosteum—its

vessels are enlarged, carrying more blood than formerly. The bone corpuscles of the cementum change shape, and become connective-tissue cells. Those of the dentine follow the same course. The same process takes place next the pulp, and the pulp becomes larger.

This paper was also referred to the Publication Committee.

The report of the Committee on Microscopy being called for, Dr Atkinson read a paper, by Dr. R. W. Varney, of New York, on "TRICHINA SPIRALIS."

The paper stated that of all the *entozoa* now known, this has for some time attracted the widest share of attention, being the cause of a severe and often fatal disease, called "*Trichiniasis.*" This disease manifests itself in the intestines and in the muscular tissues of the human race, and is caused by eating raw or partially cooked pork infested by the trichina spiralis. The author claims that the flesh of cows, sheep, fowls, etc., used by man as food, is never so infested, and hence the origin of the disease in man is *always* in the use of pork.

The paper draws a proper distinction between measly and trichinized pork, the so-called "measles" being common tape-worms in their encysted stage, while the trichina belongs to the order of "thread-worms." The difference between the two conditions, as examined by the microscope, and the different stages of development, resulting in tænia in the one case, and trichina in the other, were clearly set forth by the paper; but we have not space to give this in detail.

When trichinized pork is examined by the microscope, it is found to abound in minute ovate cysts, from $\frac{1}{60}$ to $\frac{1}{40}$ of an inch long, and from $\frac{1}{90}$ to $\frac{1}{70}$ broad; and it is claimed by some that 30,000 of these cysts or capsules have been found in a cubic inch of muscle. In these cysts the trichina lodges, usually in a spiral coil. When it is removed from its investment, it measures about $\frac{1}{20}$ of an inch in length and $\frac{1}{600}$ of an inch in diameter.

When trichinous pork is eaten raw, or but partially cooked, the worms are released from their capsules in the process of digestion, and soon arrive at maturity—the two sexes being about equal in number, the females being of larger size than the males. After fecundation the males rapidly disappear. The embryo are developed in a week or less, leaving the ovisac as minute, transparent worms. By a succession of broods, in a period of five or six weeks each female produces some four or five hundred; and as this development takes place, the victim manifests the symptoms of *trichiniasis*, as nausea, intestinal irritation, etc. When rapid diarrhœa sets in early, many of the worms are expelled, and the after symptoms are less severe. The young worms penetrate the walls of the alimentary canal, till they finally reach the muscular tissues. During these migrations, the patient suffers intensely with fever, tenderness of

the muscles, debility, and often death. If the constitution of the patient holds out till they become encysted, the trouble ceases, though they may remain alive, in this condition, many years. Then if, after death, this flesh be eaten by trichinizable animals, the same round of reproduction begins again.

The writer claims that the habitat of the encysted trichina is *extra-capillary*, and *inter-bundular*, and not *intra-bundular*, as has been claimed by some.

On the authority of a committee of the "Imperial Society of Physicians" of Vienna, the writer states that as man obtains the trichina from the hog, so the hog is trichinized by the rat.

As man is in no danger from trichiniasis, except in the use of pork, the writer states that it is unfortunate that the trichinous hog manifests no signs of disease, nor does the flesh present an abnormal appearance, except when examined by the microscope. The report closed by urging the precaution of thorough cooking as the only safeguard for pork eaters.

The paper was referred to the Committee on Publication.

Dr. Shepard, chairman of the Committee on Publication for last year, presented a written report, which was accepted, and referred to the Publication Committee.

A letter from Dr. Varney to Prof. McQuillen, forwarded by the latter, was read and referred to the Committee on Publication. It contained a brief report of three interesting cases, throwing light on the process of nature in getting rid of the temporary teeth.

The special committee on the teeth of the different races in the United States was continued.

A number of bills were presented and allowed.

Dr. Kennicott moved that a special committee of three be appointed to report on the subject of Dental Neuralgia, at the next meeting.

Dr. Spalding was afraid the multiplication of special committees would defeat the objects sought by the appointment of the various standing committees.

Dr. Watt regarded the subject as worthy of a special committee. It was likely to be overlooked by the Standing Committee on Pathology and Surgery.

The motion carried; and the chair appointed Drs. Kennicott, Cushing, and McQuillen.

On motion of Dr. Watt, an obituary committee of two was appointed, —Drs. Watt and Spalding the committee.

The reports all having been received, the President announced that remarks on them were now in order.

Dr. Judd would offer a few thoughts in reference to the papers read by Dr. Chase. He said there was sometimes a want of clearness in the

use of the term absorption, from not observing the conditions in which it is used. In order that a tissue may be absorbed, it must be alive; and when the absorption of a solid, as the root of a tooth, is spoken of, it is to be understood that it assumes a liquid state before the process is completed. When the root of the temporary tooth is absorbed, he was doubtful as to what becomes of its organic matter, whether it is used in the formation of the new tooth, or whether it is taken up by the general system.

Dr. Atkinson approved of Dr. Chase's second paper. Certainly fluidity, as well as vitality, is necessary to absorption. All things differ but in degree, as may be illustrated by motion, one degree of which results in heat, another in light, etc., the origin of this motion being in infinity, the simplest motion being our primate. He spoke of the defectiveness of our nomenclature. What has been called a "dead tooth," is one that has lost only one degree of its vitality. In reference to the disposal of the matter of the lost root, he spoke of a metamorphosis between matter and spirit, and claimed that, in order to absorption, the solid must pass into the state of liquidity, then to "gasidity," and finally to spirit, when it can go out without let or hinderance. He illustrated by the burning of gunpowder. When the combustion is not complete there is *débris*. Matter being the *débris* of spirit, when the metamorphosis is interfered with, there is disturbance. You may call this process combustion, or what you please. We use the terms creation and evolution. What is the difference? and what do we mean?

Dr. Spalding explained the general principles of absorption. He said we should remember that force is not destroyed. When an organic substance ceases to perform, it is dead; and when once dead it never lives again in the same state or form. So, when a root has lost its vitality, it does not enter the living circulation, but is thrown off as effete. The temporary tooth has performed its use, and can perform no other. He could not go as far as his friend who had just spoken. He did not believe that matter is changed to spirit. There is a limit. We can put no more matter into this material universe, nor can we destroy any that is in it. He did not want the doctrine, that matter may be changed into spirit, to go forth as the sentiment of this Association. It *changes;* but it does not cease to be matter. There can be no destruction of either force or matter.

Dr. Atkinson replied: "No destruction? Now I say there is nothing but destruction." He believed in destruction, or annihilation, caring but little which term is used. And then came a speech, earnest, eloquent, but defying the powers of shorthand, and, of course, too much for our slow pen.

Dr. Chase said, the solids of the absorbed root are thrown out of the system, mainly by the kidneys.

Dr. Judd was not quite ready to subscribe to all of Dr. Spalding's positions. He knew of no reason why the lime salts of the temporary root cannot be appropriated by the system, in the way of nutrition.

Dr. Chase said, "If what is in me is taken up and appropriated, why must I eat at all?"

Dr. Cutler inquired if effete matter is not sometimes used by the general system, as, for example, when carbon is reconsumed to sustain combustion and furnish animal heat. As to the absorption of the temporary root, it is important to inquire what it is that dissolves the salts of lime. The principal one, the subphosphate, is insoluble in most media. Remember that it is a salt—a union of an acid with a base. Now this phosphoric acid may be driven off by other acids. In this case it must be done by an acid that forms a soluble salt with lime; for an insoluble salt could not pass the cell walls, nor even the capillary vessels, nor the membranes. The chloride of calcium is a highly soluble salt, and there are others that might be formed. The lime thus thrown off finds its way out of the system through the kidneys. Tissues broken down by oxidation are given off as oxides. Thus it is that the tissues are broken down, while they are replaced, or built up, through deposits of plastic lymph, etc. When these processes cease, death is the result.

Dr. Atkinson said, then, after all, this is but a difference in nomenclature, and there is no dispute! Thus we must *come up* to the plain of friendly conversation, and the darkness vanishes—misunderstandings are wiped out. Speech-making is but a poor substitute for conversation. When we "knock dignity into a cocked hat," we arrive at clear pronouncements of truth, and we understand each other.

Dr. Peebles said that progress in science is like growth in religion—when we "become as little children" we make true progress.

Dr. Cutler could cordially join in calling this a dental revival.

Dr. Spalding regarded it as the most glorious day of his professional life.

Dr. Cutler said this was the second general meeting of the profession he had attended. He had never felt so well in his whole life before. He was going to begin anew in his professional career.

Dr. Berry alluded to his professional experience, and expressed his great gratification at the evidence of progress shown by this meeting.

Dr. Lawrence, the President, told an Irish anecdote, to prove that he felt happier than all the rest put together.

Dr. Berry said we had a right to feel happy. If the meeting had done nothing but call out Dr. Cutler's paper, it was a triumphant success.

A motion was made to adjourn *sine die*. The minutes were read and approved. The President made a brief, impressive speech, thanking the members for their kindness to him, and for their earnestness in carrying out the objects of the meeting.

And so, the Association adjourned to meet at Niagara Falls, the last Tuesday of July, 1868, at 10 o'clock A.M.

A few general remarks from the reporter may not be amiss:

We have attended all the meetings of the Association but two, and have never before seen such earnestness, and so little waste of time. This is as it should be. Each meeting should be an improvement on its predecessor.

We have made but little effort to preserve the wit, and have not recorded the "laughter" and "applause." Nor have we been as successful in preserving the *science* as we would like. Some men are harder to report than others. Some subjects are better understood by us than others—of course we could be fuller and clearer on these. We are aware of our inability to do justice to all the speakers. An honest effort is all we claim.

As to how this meeting compares with kindred bodies, we let one of the most experienced reporters and editors of our country tell in the following extract from the *Cincinnati Gazette:*

"American Dental Association.—*Character of the Assemblage.*—This body has been in session in the city for three days, meeting mornings, afternoons, and evenings. At first the attendance was small, and there seemed to be a lack of interest in the proceedings; but steadily the number of delegates and visitors have increased, and last night, in Mozart Hall, there was quite a large assemblage, in which were many ladies; and the discussions, since the incidental business was disposed of, on Wednesday, have been on important topics connected with the profession, and have been spirited and interesting. If we might be allowed to make the comparison, we would say that this Association has not only manifested greater industry than its kindred body that met here in the spring, but there are among its membership men of equal scientific talents, and, we think, of better speaking ability. There have been reports and papers read, already, by a greater number of persons, than were presented to the other body and not read, and they have been pretty thoroughly discussed also. We have not published these reports, because they would not be appreciated, or even understood, by one reader in a hundred; but they will undoubtedly subserve a good purpose to the dental profession when published for their special use."

DENTAL ASSOCIATION OF ONTARIO.

BY J. S. SCOTT, M.D., COBOURG, CANADA.

The members of the Dental Association of Ontario met in the Counties Council Chamber at 7 P.M., B. W. Day, M.D., of Kingston, President, in the chair.

After the transaction of some business, the Association adjourned until the following morning at 9 o'clock, when thirty-one members were in attendance.

R. Trotter, Brampton, called the attention of the Association to the requirement of the constitution, exacting that dentists must have had five years' established office practice in order to be eligible for election as active members. He thought the provision good.

Mr. H. T. Wood, Picton, said that the Association, when in session in Toronto in January last, fully considered the point that an established office practice, which was successful for five years in one place, was a fair test of abilities and qualifications of practitioner; that he should much regret to see the standard of qualifications lowered, but hoped soon to see it very much raised.

Mr. C. S. Chittenden, Hamilton, would increase rather than lower requirements for membership. He was pleased at meeting so many of the established dentists of the Province, and hoped we should soon have a bill passed which would settle the question as to what qualifications should be required of persons practicing as dentists.

J. S. Scott, M.D., said if he could have been certain of so respectable an attendance, he would have taken the liberty of inviting prominent gentlemen of the town to attend as visitors. He would now move, seconded by C. S. Chittenden, that the Corresponding Secretary be requested to invite physicians, clergymen, and Cobourg editors to attend the meetings of this session of the Association. Carried.

Thomas Rowe, M.D., stated that he had been requested by the publisher of the DENTAL COSMOS to apply for a synopsis of the proceedings for publication. Granted.

Mr. J. O'Donnell, Secretary of the Committee appointed at the Toronto session to draft an Act of Incorporation, read a draft of a bill to incorporate persons practicing dentistry in the Province of Ontario. Ordered to be read a second time this afternoon at 2 o'clock. 2 P.M., bill read a second and third time in Committee of the Whole and approved.

J. B. Meacham, Brantford, and J. Bowes, Ingersoll, were balloted for and elected as active members. F. G. Callender, on part of committee, reported a draft of by-laws, which were adopted.

C. S. Chittenden read a paper upon dentition, which was well received, and ordered to be printed.

R. Trotter moved, seconded by C. S. Chittenden, that in the opinion of the Association it is not desirable that the title of Dr. should be applied to dentists who are not legally entitled to it. Carried.

G. V. N. Relyea presented to the Association, for inspection, models of irregular teeth which had been straightened by mechanical appliances. He also read a paper on Nitrous Oxide Gas, stating that he had administered chloroform probably one thousand times; that he had invariably required that a physician should be in attendance, as it not only served to remove the timidity of the patient, but, in case of disagreeable result the best assistance would be at hand. He

had had only one case of apparent danger from chloroform; but there was always a risk with regard to its results; and in case anything disagreeable occurred, the presence of a physician would divide the responsibility. He considered nitrous oxide gas preferable; he had administered it eighty times during the last nine months with the most satisfactory results. He always required the presence of an assistant, but did not think it necessary to insist upon the presence of a physician; he did not consider it dangerous in the sense in which chloroform was dangerous. In one fatal case referred to—laughing gas—a *post-mortem* examination revealed the fact that organic disease existed.

J. S. Scott, M.D., of Cobourg, replied to Dr. Relyea's question, as to his experience with nitrous oxide gas. He had been using it with most satisfactory results for little over a year. He met with difficulty at first in the way of procuring proper apparatus for manufacturing and preserving the gas. It should be kept on hand in a gasometer, ready for use. He had administered it nearly a hundred times. He kept a register, with the names arranged alphabetically. The best way to administer gas was from a gasometer, dispensing with the rubber receiver.

M. M. Johnson, B.A., of New York, said he was largely interested in manufacturing apparatus for making and administering the gas, and would gladly receive any suggestion as to the best kind of apparatus. He was of opinion that gas should be passed through chemicals, to neutralize any poisonous acid that might be present.

Dr. Scott replied that the old way of passing gas through three wash-bottles containing chemicals had not proved satisfactory; that chemicals would soon become charged with impurities generated by increased heat required in using three bottles. One bottle filled with water was all that was necessary; whatever else might be found most plausible was of little consequence, when actual practice showed that one bottle gave better gas than three.

J. B. Meacham, Brantford, said that he had succeeded very well with gas. He had formerly made it in the old way; but intended to use a gasometer, as he was satisfied it was the better way.

G. V. N. Relyea moved, seconded by H. F. Wood, that in the opinion of this Association, dentists should not administer chloroform except in presence of a physician. Carried.

Moved by J. O'Donnell, seconded by W. C. Adams, that this Association considers displaying of cases of mechanical dentistry at the door as a means of attracting the public, and also of doggerel rhymes and high-sounding puffs of capability, as a species of quackery beneath the dignity of any respectable dentist. The Recording Secretary stated that the Medical Council, while in session in Ottawa recently, had passed a resolution approving of the passing of an act to incorporate the dental profession.

Drs. Berryman and Patullo, members of the Medical Council, were elected honorary members of the Association.

Moved by H. T. Wood, seconded by L. Lemon, that G. V. N. Relyea, C. S. Chittenden, F. G. Callender, and J. B. Meacham be elected delegates to the American Dental Association. Carried.

TENNESSEE DENTAL ASSOCIATION.

THE following named members of the dental profession in Tennessee met by agreement at Nashville, on the 26th day of July, 1867, and organized the Tennessee Dental Association: W. H. Morgan, Nashville; J. B. Wasson, Memphis; J. C. Ross, Nashville; W. T. Arrington, Memphis; R. Russell, Nashville; Alex. Hartman, Murfreesboro; G. W. Acree, Memphis; J. A. Arrington, Jackson; W. R. Johnston, Columbia; T. E. Beech, Franklin; S. J. Cobb, Nashville; W. P. Wilson, Nashville; M. McCarty, Pulaski; H. M. Acree, Clarksville.

The following officers were elected for one year:

President—W. H. Morgan.

First Vice-President—J. B. Wasson.

Second Vice-President—J. C. Ross.

Recording Secretary—W. T. Arrington.

Corresponding Secretary—R. Russell.

Treasurer—Alex. Hartman.

Executive Committee—G. W. Acree, J. A. Arrington, W. R. Johnston.

EDITORIAL.

OBITUARY.

Two eminent men, MICHAEL FARADAY, the English Chemist, and ALFRED ARMAND VELPEAU, the French Surgeon, died within a few days of each other, during the past month, and their lives afford valuable and instructive lessons to young men, demonstrating that by patient, well-directed and protracted effort, men of ability can raise themselves from the humblest stations to the most exalted and enviable positions, even in countries where rank, wealth, and family influence have almost unlimited sway. They were born and reared in childhood under circumstances in many respects analogous, the father of each being a blacksmith. So limited were the means of their parents, that Faraday was unable to obtain anything more than the most ordinary rudiments of education at a common day school, and, at the age of thirteen, was apprenticed to a

bookbinder, selecting that trade so that he might be among books, and gratify his longing for knowledge; while Velpeau, destined by his father to follow the laborious trade from which he derived his subsistence, was engaged at the forge in keeping the bellows in play as soon as he was able to run about and use his limbs. Being of a quiet, reserved disposition, he rarely indulged in the amusements of his companions, but occupied his leisure time with an occasional lesson from some well-disposed person in learning to read and write. It is said that the books out of which he learned to read were three old worm-eaten, thumbed, and dirty works, viz.: a treatise on *Hippicratie, the Poor People's Physician*, and the *Rustic Mason*. Not being able to procure new books, by frequent perusal he committed these almost entirely to memory at a very early age, and they seem to have given a decided direction to his mind, for no sooner had he acquired a knowledge of the properties of some of the remedies in common use than he commenced their application among his companions. About this time a curate was sent to reside in the village, who undertook the gratuitous instruction of the children of his flock, Velpeau being one of his most eager and attentive scholars. Unfortunately this good friend died in four months after settling in the village. At sixteen years of age Velpeau attracted the attention of a young physician, who interested himself in his behalf, and mentioning his case in the most favorable manner to a wealthy man in the neighborhood, the latter granted him the privilege of prosecuting his studies with his own children, directing their preceptor to afford him every opportunity for acquiring knowledge, which he availed himself of to the fullest extent. As will be seen in the accompanying sketch of their careers, by properly-directed efforts, they overcame all the disadvantages that surrounded their earlier years, and became not only the chosen companions of men of science and letters, but leaders in their respective walks of life, and whose words were received as authority by the most distinguished men of the day.

"Michael Faraday was born in Surrey, England, on the 22d of September, 1791, and was consequently in the 76th year of his age at the time of his death. His father being a mechanic, earning his living as a working smith, the deceased was unable to obtain other than the most ordinary education at a common day school. When a lad of thirteen years he was apprenticed to a London bookbinder to learn the trade of his master, and having, through his position, the means of obtaining several scientific works, he studied them carefully, and by the assistance of one of these, a treatise on electricity, was enabled to construct his first electrical machine with a glass vial. Subsequently, through the kindness of a member of the Royal Institution, Mr. Faraday obtained permission to attend the last four lectures of Sir Humphrey Davy in 1812. He afterward addressed Sir Humphrey a letter, asking for some scientific employment, and that humane and kind-hearted philosopher, after ascertaining the ability of the applicant, promptly complied with

his request, and made him his chemical assistant at the Royal Institution. The deceased subsequently traveled throughout Europe as the assistant and amanuensis of his patron, and on his return to England resumed his position at the Royal Institute. The progress of Mr. Faraday was now rapid and successful. In 1820 he discovered the chlorides of carbon; in 1821 the mutual rotation of a magnetic pole and an electric current; and in 1823 his exertions led on to the condensation of the gases. In 1833 he became the Professor of the New Chair of Chemistry at the Royal Institution, a position he ever after held. The honors which his own and foreign governments and institutions bestowed upon him for his services to science were numerous. He was a Commander of the Legion of Honor, Knight of the Prussian Order of Merit, Fellow of the Royal Society, Doctor of Civil Laws, one of the eight foreign associates of the Imperial Academy of Sciences at Paris, besides being a member of many learned and scientific bodies in Europe and America.

"Alfred Armand de Velpeau was seventy-two years old at the time of his death, and was the son of a farrier, and was born at Breche, in the department of Inde-et-Loir, May 18th, 1795. He displayed a natural aptitude for surgery, and by the aid of one or two friends, entered the hospital at Tours, and graduated at Paris in 1823. In 1830 he was appointed surgeon to one of the hospitals, and in 1835 Professor of Clinical Surgery. He was the author of several works on surgical science, which at once obtained high rank in the profession. In 1842 Velpeau became the President of the French Institute of Surgery, and in 1859 received the appointment of Commander of the Legion of Honor. Of late years he had withdrawn in a great degree from professional life, owing to age and infirmity."

THE NEW BASE.

Dr. Charles L. Houghton, of Poughkeepsie, writes in reference to the new base of Dr. Colburn, that after considerable experimenting he has failed to obtain satisfactory results, and considers it of no practical value as a base for permanent work.

He says it lacks strength, warps in cooling, does not adhere well to the plate, becomes quite soft in warm water, and, all things considered, is very much inferior to the gutta-percha base.

NEW ORLEANS DENTAL COLLEGE.

The profession in the South will be pleased to know that a Dental College with the above name has been established in New Orleans. The regular course of lectures will commence on the first Monday in November, 1867, and continue four months. The faculty are Jas. S. Knapp, D.D.S., Professor of Theory and Practice; Andrew F. McLain, D.D.S., M.D., Professor of Institutes of Dentistry; Wm. S. Chandler, D.D.S., Professor and Demonstrator of Dental Surgery; George J. Friedrichs,

D.D.S., Professor of Dental Science and Mechanism; George W. Dirmeyer, M.D., Professor of Materia Medica and Therapeutics; E. S. Drew, M.D., Professor of Anatomy and Physiology; Henry Laurence, D.D.S., Demonstrator of Mechanical Dentistry; Alfred W. Perry, M.D., Demonstrator of Anatomy. The Chair of Metallurgy and Chemistry will be filled at an early day.

CORRESPONDENCE.

Prof. Kingsbury, who has been on an extended tour through Europe, Egypt, and Asia Minor, sends a long letter from Paris, in the course of which he refers to the kindness and attention he has received from members of the dental profession abroad, dwelling particularly upon the politeness and hospitality of Dr. Thos. W. Evans, at whose rooms he had an opportunity of demonstrating the use of nitrous oxide, and at a subsequent *séance*, in the presence of a number of eminent physicians and surgeons of Europe, gave an account of the discovery and introduction of anæsthesia, doing full justice to the claims of the lamented Horace Wells, as the one to whom all honor is due as the discoverer of that inestimable boon to suffering humanity.

On his return home, Prof. K. proposes publishing an account of the present condition of dentistry in Europe, as he observed it, in this magazine.

Prof. Hayden, who is making a geological survey of *Nevada*, under the authority of the United States Government, sends the following interesting letter, descriptive of the results so far. Prior to starting for the West, he promised to prepare a series of papers for the Dental Cosmos on the *Teeth of the Fossil Vertebrates of America*, which will be published with illustrations during the winter. Embracing the description of some animals which he was the first to discover, they will be the more interesting and instructive on account of their novelty:

"Omaha, Neb., August 23, 1867.

"My dear Doctor:—I have been thinking of writing you a letter for a long time, but so busy have I been that I put off writing to any one. I have explored some twelve counties of the State. Now I go north to the Niohala, and hope to get into the great bone region somewhat. I have been moderately successful in my explorations; made important collections in fossil remains, and gained a large amount of valuable information. After the first of October I shall explore along the U. P. R. R., which will then be at the mountains. This is a gigantic scheme, greater than Sherman's march to the sea. They are marching a line of railroad to the great Pacific, overcoming more obstacles than any military ever overcame. This will be one of the victories of peace far greater than any of war. I wish you could ride with me on it. You must see it before you die, or you would not rest easy in your earthy bed. * * *

"Your sincere friend,

"F. V. Hayden."

PERISCOPE OF MEDICAL AND GENERAL SCIENCE IN THEIR RELATIONS TO DENTISTRY.

BY GEO. J. ZIEGLER, M.D.

"*Transference of Animal Tissues and Artificial Cell-production, in a series of experiments.* By the Chevalier PAOLO MANTEGAZZA, Professor of the University of Pavia, etc., etc., with figures by Sign. G. BIZZOZERO. Milan, 1865, pp. 80.—It is impossible by a brief abstract to do anything like justice to the admirable investigations of this well-known experimenter. We cannot too strongly recommend them for appreciation and study, as set forth in these brief pages. They include 287 experiments, of which no less than 242 are devoted to transplantation of various organs in animals of the same or other species; and the remainder to insertions of blood and fibrine within the textures, in relation to the question of the spontaneous growth of cells or their production from tissue and plasma. Of the larger group no less than 208 experiments refer to transplantation of the testicle, chiefly under the skin, or into the abdominal cavity, and these are performed for the most part on batrachians. It will be seen that one unfortunate frog had forty testicles engrafted on him, with no accession to his constitutional strength, for somewhat more than in the others the muscles on which they rested became subject to the process of fatty degeneration. The best time for this class of experiment with frogs is in the winter season; they are far less successful after the period of fecundation is gone by. When included beneath the integuments in this species, male and female alike, the testicle seems at first to live by endosmosis; it may then be pushed about from side to side, but soon it contracts firm adhesions with formation of vessels; sometimes a perfect pouch is formed, with a minute outlet, but the experimenter was never so fortunate as to perceive the exit of zoosperms from such an orifice. Transplanted into the abdominal cavity, the testicles form adhesions to the peritoneum, in which the new vessels are so considerable as to be sometimes discernible by the naked eye; in other cases their existence was placed beyond a doubt by filling them with colored injection from the heart. The process of formation of these vessels and of the connective tissue in this as well as in other experiments of the kind constitutes a very advantageous field of study for the histologist. It is remarkable how very seldom putrefaction and septicæmia complicate these experiments. On the other hand, fatty degeneration is prone to occur, not only in the implanted viscus, but also, though in less degree, in the muscle on which it may chance to rest. In the mammiferæ the result of identical experiments is far different, the same proceeding with them leading to suppurative acts. In one more fortunate case than the rest of transferred testicle in a guinea-pig, fatty degeneration, with loss of volume, was the result, and very probably in course of time all trace of the organ would have vanished.

"Not less interesting in character are those experiments which Signor Mantegazza has performed on the stomach and intestines of frogs. He discovered that the whole gastro-enteric tube can live for a month and a half under the shelter of another organism, drawing life and sustenance from it through the medium, as it would appear, of vessels and connective

tissue. It is interesting to find the stomach completely severed from its attachments and included in the belly, yet preserving for at least twenty-seven days its full integrity and the faculty of secreting a digestive fluid. An independence of nervous influence is so far proved as concerns this class of creatures. In fact, the stomach was generally found to be vastly distended with mucus, so much so as in some cases to detach the confining ligatures at their extremities, or to seem at the point of bursting. The digestive power of the gastric secretion was always found to be perfect.

"Next in interest to the experiments of transplanted testicle seems to us those which Signor Mantegazza has performed with the spleen. In the character of autonomy this organ seems to stand nearest to the testicle. Not only does it live under the artificial conditions which we are describing, but it gains in weight, presenting unimpaired after many months the exact identical anatomical structure it possessed when separated from its original attachments; similarly with the testicle, in its novel site it contracts adhesions of a fibrous or vascular character. Such, at least, is the case in batrachians; in the mammiferæ it was different only in an exceptional case, where vascular adhesions formed; in this instance the animal died from septic poisoning; in some other cases, after a few weeks' term, the spleen had wholly disappeared, absorbed, no doubt, after the occurrence of fatty degeneration in its structure, for fat is generally found upon the spot. This tendency not only occurs in animals of the same kind, for it equally happened when a rabbit was engrafted with the spleen of a guinea-pig; in this case it disappeared completely with the complication of a little pus at the very first. So far, however, is this from being of necessity, the professor thinks it not improbable that a spleen might remain indefinitely without change, fixed and adopted into the organism where it had been implanted. The transplantations of brain substance made by Professor Mantegazza in the frog are chiefly remarkable for the quantity of pigment, either under the form of round or oval cells, or in that of the more common stellate and irregular shapes; such a condition is a frequent result; it might, indeed, be called a pigmentous degeneration. Amylaceous degeneration, we can only say, stands in need of further proof than the instance given; that of fat is common enough, and a certain amount of connective tissue often characterizes the spot of transplantation. The spinal marrow of a rabbit, inserted under the skin of its fellow, doubled in weight in nine days' time, and contracted such firm adhesions as were hard to separate, proving a strong attraction at least of the nutritive elements of life to that spot. The muscles, when transplanted in frogs, are found to preserve their contractility for months. They gain in weight, the fibrine diminishes with increase of fatty matter; indeed, they mostly undergo fatty degeneration; the same occurs to a less extent in the part on which they rest. Virchow observed much the same thing in cysts of the extra-uterine fœtus left for many years in the body of the mother; the fat was seen to be principally in the cyst and in the tissues most closely in contact with the vessels of the parent. The tongue, when transplanted, is subject to the same law as other muscles; its cilia were once observed in movement by Sr. Bizzozero after eleven days' incarceration. More than any other muscle the heart resists and defends itself from this process in transplantation, especially with the higher class of animals, and in widely divergent species, yet a small heart transplanted into an animal of disproportionate size and

weight, would probably end by being absorbed. Ollier has so far exhausted the subject of transplanted periosteum, that nothing on that head need be said. The most important fact in the implantation of bone is the excessive rapidity with which the periosteum becomes surrounded with a capsule of connective tissue adhering to the surrounding textures, and forming a bed for numerous new vessels.

"The conclusions at which Professor Mantegazza arrives are that there is a reciprocal action, a vital catalysis, if such an expression may be allowed. The graft receding more and more from its individual bent, becomes adopted into a new circle of existence, as the organism which is its receptacle is brought under its influence. The tissues operate mutually by contact; the host and guest arrange an understanding for their common benefit, neither of them being subjugated, and neither wholly passive. The death of the engrafted part by putrefaction is rare, but a perfection of tolerance, it must be observed, exists at the expense of nobility in species, or rather the degree of tolerance is in inverse proportion to superiority of rank and capacity in the zoological series. The tissues and organs which display most of autonomia in the batrachians are the periosteum, the spleen, and testicle, and the spur in the cock; those which display least of it are the liver, brain, spinal marrow, and nerves; the last increase in weight, but soon lose their striated and transparent appearance, undergoing the fatty metamorphosis. The lymphatic vessels play a very active part in the histological changes which occur in transplanted tissues and organs, in further proof of which the neighboring glands often attain an extraordinary size. It is common for transplanted tissues to increase in weight before being absorbed. Putrefaction is favored by a high rate of temperature and by weakness of the animal on whom the organ is engrafted, and, above all, by divergence of species in the subjects of the dual experiment.

"Professor Mantegazza has devoted a section of his treatise to impugning the well-known Berlin doctrine *omnis cellula á cellulâ*, which in an especial manner he revolts from. The experiments undertaken in this direction are forty-five in number. They consist in occlusion within the animal organism of blood and artificially pure fibrine, and in one case also of albumen. The fibrine, he says, in fourteen to twenty hours' time, breaks up into granules which become nuclei, organization always taking place from without inwards in the transplanted mass. Some of the cells grow from a large nucleus from which loosens out a thin wall, while others are formed by one or more nuclei round which a membrane gathers; these centres of attraction rapidly increase the production of material in the fibrine mass, and, finally, the structure of the tumors becomes so rich in vessels as to be easily injected. In an experiment we will notice, No. 273, injected blood had been put aside by the professor for one day before insertion; he squeezes some fluid from the wound two days after the experiment, and finds very large cells, 0·011 to 0·020 millimeters, which contain one, two, three, or even seven nuclei These nuclei have a diameter of 0·0041 to 0·0072, and some of them are evidently formed out of blood-globules included in the cell, a fact of which he is perfectly assured. In some experiments of tying the jugulars of rabbits he observed the copious formation of nuclei and cells in the fibrine within the vein, with disappearance of blood-globules. In the great difference which exists between the behavior of blood included between ligatures in a vein or artery, he was enabled to make important observations confirmatory of

his idea and subversive of those of Virchow. In the vein the more rapid coagulation of the blood, and formation of enormous granular cells, with the limitation of the pus to the point of ligature, are points on which he insists, while in an experiment where he removes and subsequently replaces the carotid of a dog, the animal gets well without production of inflammation or formation of pus, and he asserts that in such a case the blood is converted into connective tissue without formation of any kind of cells or nuclei. The disappearance of the blood-globules and their diminution in size, the early granulation of the fibrine and loss of fibrilization, are points which he brings most prominently into notice. The nuclei and granulations he attributes strictly to the fibrine."—(*British and For. Med.-Chir. Rev.*)

Metamorphosis of Tadpole.—In the course of a long and instructive paper on this subject in the *Quart. Journ. of Microscopical Science*, W. U. Whitney offers the following of special interest: "Curious and beautiful is the final stage of the metamorphosis, when the waning tadpole and incipient frog coexist, and are actually seen together in the same subject. The dwindling gills and the shrinking tail—the last remnants of the tadpole form—are yet seen, in company with the colored, spotted skin, the newly-formed and slender legs, the flat head, the wide and toothless mouth, and the crouching attitude of the all but perfect reptile. With the loss of the *inner* gill, the teeth and fringed lip possessed by the tadpole also disappear, because the *labial* artery, which supplies these organs with blood, has its origin in the gill, and proceeds directly upward to the mouth. Simultaneously, therefore, with the loss of the gill, the oral appendages proper to the fish are also removed.

"By the process now described, the three systemic arteries become *continuous* with the corresponding *efferent* trunks that convey the blood for distribution through the body, while, simultaneously, the vital fluid is being abstracted from the *special* trunks belonging to the gill and its vascular crests. These, with the gill structure connected with and dependent upon them, being thus deprived of their blood, shrink, become absorbed, and so disappear. Such appears to be the beautifully simple mechanism by which the transition in the type of the respiratory function from fish to reptile is accomplished."

Congenital Union of Gums. By W. S. Carter, M. D., Pittsboro, Ind.—"Mrs. W. was delivered, after an easy labor at full term, of a living male child. The infant was perfectly quiet for a few moments after its birth, and then spasmodic respiratory efforts were made. Thinking the throat might be obstructed by mucus, I endeavored to introduce my finger to remove it. The finger passed readily between the lips, but to my astonishment I could get it no further than the gums, which both by sight and touch I found firmly united.

"As it was necessary to act promptly, I immediately, with the assistance of my partner, Dr. Tilford, divided the tissue uniting the gums. This appeared to be about as thick as the gums and cartilaginous, extending as far back on either side as the angle of the jaw. Notwithstanding this free division, which enabled the child to breathe with more facility, the jaws were immovable.

"After letting the patient rest a few hours, Dr. Sellers, of Brownsburg, visited the patient with me; and it was decided to use some force to sep-

arate the jaws, and make a further careful exploration. This exploration showed us a tough membrane, one-eighth of an inch in thickness, passing from the palate bone above, and inserted into, the lower gum. Upon the division of this, and the use of some little force, the jaws were separated.

"In two weeks the gums had healed, the child took nourishment readily, and was doing well.

"Other malformations also existed in this case, viz.: the fingers and toes were webbed, and the ears were in rather a rudimentary condition—the integument passing from the head over the anterior surface of the upper third of each of these.

"When the mother was about three months pregnant, her son, about six years of age, had a severe convulsion, the jaws being spasmodically closed. She was alone at the time, and her terror was excessive; and, indeed, since then, during all the remaining months of her pregnancy, she states the frightful scene has scarcely ever been absent from her mind.

"REMARKS BY THE EDITOR.—We have delayed for some weeks the publication of Dr. Carter's extraordinary case, in order that we might, if possible, find recorded some similar cases or case; but after a diligent search we have been utterly disappointed. Even Saint-Hilaire, to whose study of the various anomalies of organization science is so greatly indebted, fails us in presenting any analogous instance.

"While almost any one of the external openings of the body may be imperforate, yet this condition much oftener affects the inferior than the superior orifices of the trunk—*e.g.* closure of the anus as a congenital condition is more frequently met with than closure of the eyelids, closure of the vagina than of the external auditory meatus.

"In regard to congenital adhesions of the mouth hitherto described, they have been from adherence, sometimes complete, in other instances partial, of the lips. Even this malformation the illustrious Boyer spoke of as a possibility, never having seen it; but Velpeau discovered that Haller had pointed out its occurrence in the human species and also in the inferior animals, that Schenkius had met with cases upon which he had to operate, and that Desgenettes had seen a seven months' fœtus with imperforate mouth.

"In Saint-Hilaire's work, chapter iii., *Des Anomalies par continuité des parties ordinairement disjointes; section* i., *Des Anomalies par Imperforation*, will be found the following, which may be of some interest in connection with Dr. Carter's report: The imperforation of the nares is much less frequent than that of the eyelids; nevertheless Littré and Jean Bianchi have seen it in subjects in whom other irregularities also were found, and Oberteuffer has also several times observed the same condition.

"In the case mentioned by Littré, the closure of the nares was complicated with closure of the mouth, the skin passing over both apertures, an anomaly of still less frequent occurrence. The closure of the mouth has also been seen when the nares where unobstructed, but these cases presented various other deviations also.

"As to the possible influence of the sudden and severe terror to which the mother was subjected, which Dr. Carter mentions, in causing the malformation, it probably is better neither to affirm nor, still less, to deny. Certain it is that the tendency of the observant and thoughtful in our profession is, not to reject as 'old wives' fables' all that is told us

of the very strong influence of maternal impressions upon the fœtus, fables which have so long found such general credence with mothers and with the public. Those who are interested in the study of this question will find an admirable and philosophic discussion of it, by Dr. Alfred Meadows, in the seventh volume of the *London Obstetrical Society's Transactions.* It occurs in connection with the report of a case of *Monstrosity*, given by Dr. M., the mother attributing the deformities of her offspring to the fact, that during the earlier weeks of her pregnancy she was greatly horrified by being shown some of Aristotle's plates, in which were exhibited some deformities resembling this, and specimens of other monstrosities."—(*Western Journ. of Medicine*)

Teeth in Ovarian Tumor.—"Dr. William A. Reed, of Philadelphia, exhibited to the Am. Med. Inst. a remarkable bone taken from an ovarian tumor during a *post-mortem* examination. It resembled in shape the temporal bone, and had three teeth, resembling molars, inserted in different portions of it. It was taken from a subject forty years of age, who presented unmistakable evidences that this could, in nowise, have been the result of pregnancy."—(*Med. Investigator.*)

"*Partial Anchylosis of the Jaws, the result of an Injury; Treatment by Forcible Dilatation.* Under the care of Mr. Spencer Watson, King's College Hospital.—In the early part of March, 1867, a girl was brought to the hospital, by her mother, with a partial anchylosis of the jaws, which allowed a separation of the front teeth of only half an inch. This limitation of movement was attributed to an injury to the jaw in a fall from a first floor window six years previously. Ever since that time there had been difficulty in masticating, and the child was now almost continually munching soft food, such as bread and butter, in order to get sufficient nourishment.

"The lower jaw, when opened, moved somewhat obliquely to the left, and this obliquity was probably due to a shortening of the ramus on that side. Some amount of thickening could be felt near or at the temporo-maxillary joint on that side, and this may very possibly have resulted from a fracture in the neighborhood of the joint, with subsequent inflammation of the joint itself.

"On March 9th, acting on the supposition that there were some fibrous bands around the joint which checked its movements, Mr. Watson had the patient put under the influence of chloroform, and then, thrusting a screw-dilator as far back as possible between the molar teeth on each side, commenced forcible dilatation. The screws were worked alternately on each side, and with very gradual and slow movements; and the jaw very slowly yielded, but without any audible crack or other evidence of rupture of fibrous bands.

"The operation was not followed by any bad symptoms, and the only thing complained of was tenderness and pain in the region of the left joint for the first two or three days, with a very trifling amount of swelling. After this swelling had subsided, wedges of cork were placed between the molars on each side, and allowed to remain there constantly (excepting at the child's meal times), with a view of preventing a return of contraction. The result was, that the jaw could be opened freely, so as to leave an interval of an inch and a quarter between the incisor teeth, and to give much more freedom of mastication.

"The same operation was repeated on March 30th, but without giving any further mobility. The result, however, was considered by the patient and her friends as very satisfactory, as the child was now able to take her meals with very little difficulty."—(*Lancet.*)

"*Case of Disease of the Antrum.* Under the care of MR. HENRY SMITH.—It is not always easy to distinguish between fluid accumulation in the antrum, and a tumor, malignant or otherwise, developed in the interior of that cavity. In the former case the uniform enlargement of the antrum, and the previous history, may enable the surgeon to diagnose that the swelling is not of a solid character; but it sometimes happens that the appearances of the part are such as to mislead even experienced practitioners, and it is recorded of no less a man than Gensoul, of Lyons, to whom surgery is indebted for the performance of the first case of excision of the upper jaw, that he once cut down upon the cheek with the intention of removing the upper jaw, when the case was not one of tumor, but of purulent accumulation within the antrum. A case lately presented itself at King's College Hospital, in which the fortunate supervention of an attack of erysipelas of the face saved the surgeon from a repetition of Gensoul's mistake. A middle-aged woman was admitted under Mr. Smith's care, with a large swelling in the right cheek, which was pronounced, after examination by Sir W. Fergusson and Mr. Smith, to be probably due to the development of a malignant tumor in the antrum Highmorianum. There being no enlargement of the glands under the jaw, the case was thought to be a favorable one for excision of the upper jaw. Fortunately, however, while the patient was in the hospital she had an attack of erysipelas of the face, which lasted between two and three weeks; and at the end of this time the swelling in the cheek, which had increased considerably, diminished suddenly on the bursting of an abscess beneath the under eyelid. This materially altered the view taken of the case, and then all idea of removing the upper jaw was abandoned. As the swelling in the cheek, however, did not disappear entirely, after another three weeks had elapsed, Mr. Smith performed the usual operation for evacuating any fluid matter pent up within the antrum. The second molar tooth, the fangs of which correspond to the floor of the cavity, was extracted, and a large triangular trocar was pushed up its socket. No pus came away, however; and, after nipping away a portion of the alveolar ridge, so as to be able to pass a finger into the antrum, the cause of the mischief was found to be necrosis of a portion of the bony wall of the antrum, which part was consequently removed. This case is of considerable interest as showing the difficulty of making a sure diagnosis between disease calling for removal of the upper jaw, and disease limited to a portion of the maxilla only. It teaches this lesson, that in all instances in which the least doubt exists as to the nature of the affection, a preparatory puncture should be made into the antrum by means of a perforator, either pushed through the socket of the second molar tooth after its extraction, as was done by Mr. Smith, or through the canine fossa under the cheek."—(*British Med. Journ.* and *Half-Yearly Abstract of Med. Sci.*)

"*Cyst in the Antrum, obstructing Nostril; Operation; Recovery.*—Mary B., aged thirty, a healthy married woman, came under Ass. Surgeon THOS. BRYANT'S care, Guy's Hospital, with a cyst which projected

into the right nostril, causing its partial occlusion, and expanded the antrum so as to form a tumor in the cheek. It had been growing for fourteen years, but had caused obstruction to the nose for only a few months. It was not attended with much pain, and she had sought advice more from the disfigurement occasioned by the disease than for the distress occasioned by the new growth. Having little doubt as to the nature of the disease, the cyst was tapped beneath the cheek, and about two ounces of a blood-stained, limpid, albuminous fluid drawn off. The cyst at once collapsed, and the features recovered their normal shape. In a few weeks, however, the tumor became as large as ever, the fluid having re-collected. The cyst was accordingly tapped again, and its cavity plugged with lint. In four days the lint was removed, free suppuration having taken place. Everything went on well for some time, when a fresh collection of matter made its appearance toward the nostril. This was accordingly freely opened by a bistoury into the nose, when rapid convalescence followed. This patient when seen two months subsequently was quite well."—(*Lancet.*)

Tumor of Antrum, etc.—"At a late meeting of the London Medical Society, Mr. Canton exhibited a patient who had been operated on for what proved to be a myeloid tumor in the antrum of Highmore. This had been excised, and the patient was now well, only, as Mr. Canton had made a horizontal incision below the eye in removing the diseased mass, and the integuments had considerably shrunk, there was a slight degree of ectropion He showed a photograph of another case where the whole of the upper jaw had died and been removed, yet, in course of time, the gap had filled up and the deficiency was scarcely noticeable."—(*Med. Times and Gaz.*)

"*Inflammation of the Buccal Glands and Membrane, caused by the use of Mercurials.*—Salivation, caused by mercury, may be distinguished from all other forms, by the brassy taste, fetor of the breath, sponginess and ulceration of the gums. The diagnosis of mercurial salivation demands in some instances attention not only in a medical point of view, but also in a medico-legal point. In some cases salivation does not appear until months have elapsed after the administration of mercury has been abandoned. Suediaur has met with instances where the interval was several months; Cullerier with one where it was three months. After the use of mercury has been abandoned, and salivation, one of its results, has declared itself, it may continue to harass the patient, in some rare instances, for months, or even years.

"Cases have been recorded by Linnæus, Suediaur, Colson, and others of its continuance for periods varying from one to five, or six years. (*Copland's Med. Dict.*, p. 457.) Death may ensue (says Copland) from the mildest preparations, and even from comparatively small doses, generally in consequence of severe salivation, or of gangrenous destruction of parts of the mouth and fauces, and the vital depression produced by the mineral and by the local disorganization. In addition to the ordinary remedies in use for the relief of this malady, such as belladonna, opium, potassæ chloras, sulphur, acid, sulphuric dil., alcohol, alum, argenti nitras, catechu, creasote, iodine, borax, tannic acid, and many other agents, rhatany should hold a conspicuous place as one of the most valuable agents. Its effect is said to be speedy and efficient. As an

application for moderating and reducing pain in ulcerations of the mucous membranes, to burns, ulcers, and blisters on the skin, rhatany effects a decrease of pain, it is said, with a marvelous rapidity."—(*Journal of Materia Medica.*)

Syphilis Transmitted by the Mouth.—"M. DECHAUX, in a recent number of the *Gazette Médicale de Lyon*, gives an interesting narration of the propagation of syphilis, by the mouth, at a bottle factory to which he is attached, at Montluçon. It seems that the glass-blowers at such establishments are of a nomad character, wandering from factory to factory in search of work. One of these men, not having the best of reputations, had in vain sought for employment, having been rejected at various workshops. At last, the workmen at Montluçon, touched by some sonorous phrases, such as 'he demanded the sacred right of labor in the name of that necessity which had so long weighed him down,' agreed to allow him to join one of the working parties into which the *employés* are divided, his business being to commence blowing the bottles, and handing them to others to continue the same operation, so that they passed hot and moist from his mouth to the mouths of his neighbors in rapid succession. At the end of the first week four workmen had bad mouths, and next week four others, and a little later two more. As soon as any suspicion was excited, the man was submitted to examination by M. Dechaux, avowing that he had had syphilis a long time since, but had been effectually cured of it in the hospital. On examining his mouth nothing abnormal could be perceived save a small crack on the lower lip, unaccompanied by induration, and a common enough appearance among glass-blowers. The workmen on their part instituted an examination, and they as well as the doctor pronounced him free of any disease prohibitive of his working with them. Still the men above alluded to exhibited chancrous sores at the commissures of the lips and other parts of the mouth and throat, and enlarged submaxillary glands. A more searching examination of the man's prior history now discovered that during the last four years he had infected workmen in the various bottle factories he had entered, and had been driven from them; and that, in fact, the disease was seated in the nose, the bones of which were the seat of caries, giving rise to fetid suppuration. And yet this man, carrying this poison about with him, was allowed to enter factory after factory, for, says the narrator with abundant *naïveté*, 'had the nature of his complaint been inscribed on his *livret*, it would have infallibly prevented his getting employment.' However, in consequence of such delicacy, the workmen who had accepted him as a partner became the subjects of chancres of the lips, these, in five of their number, reaching the size of one or two franc pieces, and being attended with inflammation, swelling, and induration. They continued in their acute stage for about twenty days, and were not entirely removed until from thirty to sixty days—suspicious-looking ulcerations reappearing in some for a still longer period. In all there was induration of the submaxillary glands, which lasted for from forty to ninety days. In five of the cases the throat was affected, in six there was cutaneous syphilis, and in four pustules or vegetations about the anus. As may be supposed, the health of some of these workmen (eleven in number) was very seriously damaged, and in none of them could work be resumed from forty days to three months. In two instances in which it was attempted too soon, the disease was communicated to others."—(*Med. Times and Gaz.*)

Syphilis communicated by the Mouth. — In an interesting letter from Paris, on the general pathology of syphilis, published in *St. Louis Med. and Surg. Journ.*, Dr. S. H. Frazer writes: "It is well known now that syphilis does not transmit itself at a distance, but it may be communicated through the mediation of certain objects, as in the case of the tube in the glass factory, reported by Mr. Rollet. Many persons have been infected by using pipes, drinking-glasses, spoons, and forks which had been used by those who had the disease. Mr. Bellehomme mentions the case of a whole family contracting syphilis by using the same soup-spoon, their poverty rendering this necessary. Contagion by the mouth is most frequently a reciprocation between nurse and child. If the nurse, for example, has mucous patches upon the nipples, the child that she suckles will contract syphilis of the mouth; and here, as ever, the initial symptom will be an indurated chancre. If, on the contrary, the child has secondary accidents of the mouth, syphilis will be transmitted to the nurse, and will make its début on her by a chancre of the nipple. There are other modes of immediate contagion, such as the transmission of the virus by bites, suction of the breast, and by cuts or scratches of the fingers among accoucheurs, surgeons, and midwives."

New Form of Suture.—In relation to this, Dr T. G. Comstock, of St. Louis, thus writes to the *Chicago Medical Journal:* "This suture, which Dr. Hoy terms the 'rubber-suture,' is a thin, narrow ring of gum-elastic, and in his recommendation of its usefulness and practical value, I most heartily join; but he is in error, in supposing it is not mentioned in works upon surgery. Dr. W. L. Atlee, of Philadelphia, has used it for some years past in his operations for ovariotomy, an account of which may be found in the *American Journal of the Medical Sciences*, January, 1860, p. 81.

"Dr. Gross, in his Surgery, third edition, vol. ii. page 342, speaks of India-rubber sutures as having been first employed by one Mons. Rigal, and also by Dr. Atlee.

"I have, for the past four years, occasionally employed these sutures in operations for hare-lip, but when used in this operation, I cannot say that they possess any merits over the twisted suture; in fact, in an operation for hare-lip, which I recently performed, I used the last named, in preference to the elastic suture. In cases where a great many sutures are requisite, and where they must be applied without delay, these India-rubber rings may be advantageously employed; and this is particularly the case in operations for ovariotomy. Whenever the surgeon is short of assistants in performing an operation, they will be found very handy. These gum-elastic rings are now for sale at most stationers, or they may be improvised by cutting off small sections, or rings, from ordinary India-rubber half-inch tubing."

Nævi spontaneously resolved. — Dr. Thos. Smith says (*Lancet*), that "the kind of nævi most likely to undergo a spontaneous cure, and that within a reasonable limit of time, are the large, unwieldy, and turgid nævi that are usually found about the axilla, or in the fat of the breast and the surface of the abdomen, and especially the enormous mixed nævi that sometimes grow about the parotid and submaxillary regions. Here are drawings of two very large growths of this kind, involving the paro-

tid and submaxillary regions. Both of these disappeared spontaneously. Here is a drawing of a little girl who has been under my care with a nævus, the size of a cricket-ball, over the left breast. This sloughed and separated during an attack of scarlatina without causing hæmorrhage or any untoward symptom.

"The early signs of the probable retrocession of the disease are, a cessation of growth, an increase in solidity if it be subcutaneous, and a loss of brilliancy of color. When the process has fairly commenced, light-colored and dead-white spots appear on the surface, looking like the cicatrices of some caustic application; while the skin at these points is often slightly dimpled down and puckered in. Again, the occurrence of spontaneous ulceration over a cutaneous nævus may be regarded as warranting the expectation of a natural cure."

"*Hyperæsthetic Form of Chronic Alcoholism.* By PROF. LEUDET, of Rouen.—Prof. Leudet, in a memoir on chronic alcoholism, states the following facts gathered by him in the course of his studies upon the subject:

"1. That individuals who drink alcohol to excess present, at a period of that morbid evolution which is known by the name of chronic alcoholism, a collection of phenomena called *the hyperæsthetic form.*

"2. This hyperæsthetic affection is, from Leudet's experience at Rouen, more common than is generally imagined.

"3. It consists in pain varying in intensity, generally deep seated, now and then superficial; it presents itself at times in the form of a remarkable exaltation of the sensibility of the whole trunk and of the limbs. There frequently exists at the same time pain along the spinal column, analgesia or anæsthesia in certain parts of the skin, impaired motility, weakening of the muscular power, particularly in the lower limbs, cramp, and a marked exaltation of reflex movements.

"4. This hyperæsthetic form of chronic alcoholism is sometimes followed by paraplegia.

"5. The affections just enumerated depend upon disease of the spinal cord.

"6. They are liable to present remarkable variation; when they cease they very frequently leave behind a state of infirmity more or less marked, and which consists in an impairment of the motility of the lower limbs." —(*Archives Générales de Médecine* and *Half-Yearly Abstract of Med. Sciences.*)

"*Hypodermic Injection.*—The Committee of the Royal Medical and Chirurgical Society have presented their report on this subject. The result of their investigations is not very conclusive, although they have experimented with a great variety of agents—Aconitine, Morphine, Atrophine, Strychnine, Quinia, Conia, Podophyllin, Iodide of Potassium, Battley's Sedàtive, Prussic Acid, Colocynth, Aloes, and the Calabar Bean. The decisions they arrived at are as follows:

"1. That, as a general rule, only clear neutral solutions of drugs should be injected, for such solutions rarely produce local irritation. 2. That whether drugs be injected under the skin, or administered by the mouth or rectum, their chief physiological and therapeutical effects are the same in kind, though varying in degree. 3. But that symptoms are observed to follow the subcutaneous injection of some drugs which are absent when

they are administered by the other methods, and, on the other hand, certain unpleasant symptoms which are apt to follow the introduction of the drugs by the mouth and rectum are not usually experienced when such drugs are injected under the skin. 4. That, as a general rule, to which, however, there may be exceptions, clear neutral solutions of drugs, introduced subcutaneously, are more rapidly absorbed and more intense in their effects than when introduced by the rectum or the mouth. 5. That no difference has been observed in the effects of a drug subcutaneously injected, whether it be introduced near to, or at a distance from, the parts affected. 6. That the advantages to be derived from this method of introducing drugs are—(*a*) rapidity of action; (*b*) intensity of effect; (*c*) economy of material; (*d*) certainty of action; (*e*) facility of introduction in certain cases; (*f*) with some drugs the avoidance of unpleasant symptoms. This plan, therefore, is most likely to be adopted where very rapid and decided effects are required from drugs which are operative in small doses."—(*The Medical Press and Circular.*)

Histological Reagents.—"COHNHEIM and KOLLIKER strongly recommend the use of chloride of gold for demonstrating various points in histology. Tissues which have been soaked for some time in a weak solution of it, and afterward exposed to light, are found to exhibit certain parts, *e.g.* nerve-fibres, connective tissue, corpuscles, and cells in general, stained of a bluish, violet, or reddish color, while other parts, *e.g.* intercellular substance, etc., are untouched. The fresh tissue should be covered with a little of a solution, from one to two per cent. of chloride of gold in distilled water, and allowed to stand until it assumes a straw-yellow color. It should then be washed and placed in very dilute acetic acid (one to two per cent.). The color will, in the course of some hours, gradually develop itself. As a general rule, what silver salts stain gold does not, and *vice versa.* Hyperosmic acid is difficult to obtain, and dangerous, though it appears to be of great use as a reagent. Vanadic acid has been proposed as a substitute."—(*Quart. Journ. of Microscopical Science.*)

"*Falces and Maxillæ of Spiders.* Remarks thereon by JOHN BLACKWALL, F.L.S.—'Much careful investigation is yet required,' says the eminent arachnologist, 'to complete our knowledge of the various minute appendages connected with the external organs of spiders and of the purposes to which they are subservient.' Miss Staveley recently described in the Annals a row of minute teeth on the outer margin of the maxillæ of numerous species of spiders which induced Mr. Blackwall to examine the species of *Mygalidæ*, in the expectation of finding a somewhat different arrangement. The inferior surface of the base of these organs was found to be thus armed in *Mygale*, *Cteniza*, and *Atypus*. Figures of these structures are given. The late Mr. Richard Beck accumulated some valuable microscopic observations on spiders and acari, which might perhaps be published with advantage."—(*Ibid.*)

"*On the Dentition of the Common Mole.* By C. SPENCE BATE, F.R.S. —The investigation of the early condition of the teeth of mammalia is most important as bearing on the homologies of those teeth; and in such researches the microscope has necessarily to be largely used. Mr. Bate's observations on fœtal and young moles lead him to confirm the

dental formula given on other grounds by Prof. Owen. It is not, however, at all clear that such a view is the right one, for Mr. Bate's observations would serve to prove that the so-called canine of the upper jaw is an incisor."—(*Ibid.*)

"*Tobacco in Relation to Disease.*—An intelligent writer refers in the following terms to the inhabitants of a section of country in one of our Atlantic States where tobacco is extensively consumed: the complexion of these people is noticeable and suggests many inquiries. If you say that half the men and nearly all the women are very pale, you strike at the notion, but fail to fairly hit it. Their whiteness of skin is simply the whiteness of ordinary tallow. It is sallowness with a suggestion of clayeyness. The skin seems utterly without vitality, and beyond the action of any restorative stimulants; it has a pitiful and repulsive death-in-life appearance. * * The amount of tobacco consumed by these people is beyond all calculation. I hardly exaggerate in saying that at least seven-tenths of all persons above the age of twelve years use it in some form. Nearly every man and boy smokes or chews, and many of them do both, while the country women chew and smoke to some extent, and women of most classes 'dip.' * * To see a man take a quid from his mouth and put it in his hat for future use when he goes to breakfast is by no means uncommon. I have even seen men lay it under the edge of their plate at dinner for safe keeping; and one of the leading delegates in the State Convention held an immense quid between the finger and thumb of the hand with which he abundantly gesticulated during a ten minutes' speech."—(*Pacific Medical and Surgical Journal.*)

"*Tobacco.*—The Abbé Migne has just addressed a letter to a very honorable director of one of the great seminaries of Paris, condemning the use of tobacco and snuff. This letter furnishes us with an opportunity of relating a fact that is personal to us. Several times in our youth and riper age we have taken up and discarded the use of the snuff-box. In 1861, when writing our mathematical treatises, during our labors with M. Lindelof, for the calculation of variations, and when we commenced the editing of our lectures on analytic mechanics, we used snuff to excess, taking 20 to 25 grammes per day, incessantly having recourse to the fatal box and snuffing up the dangerous stimulant. The effect of this was, on the one hand, the stiffening of the nervous system, which we could not account for; on the other hand, a rapid loss of memory, not only of the present but of the past. We had learned several languages by their roots, and our memory was often at a loss for a word. Frightened at this considerable loss, we resolved, in September, 1861, to renounce the use of snuff and cigars forever. This resolution was the commencement of a veritable restoration to health and spirits, and our memory recovered all its sensibility and force. The same thing happened to M. Dubrunfaut, the celebrated chemist, in renouncing the use of tobacco. We do not hesitate in saying that for one moderate snuff-taker or smoker there are 99 who use tobacco to excess."—(F. Moigno, *Chemical News.*)

Carbolic Acid Destructive to Insects.—A correspondent of the New York *Evening Post* states (*Amer. Artisan*) that "carbolic acid has recently been successfully used near Rahway, N. J., for the extermination of mosquitoes and flies. A small piece of cloth, saturated with the acid,

was hung up in a room, and in two hours the flies had entirely disappeared. In the evening the acid was tried in the kitchen, where the mosquitoes were very troublesome, with like success. He thinks the remedy worth trying in all places where the mosquitoes are troublesome."

—

"*Deodorants.*—For many purposes dry clay is not only the cheapest but the best deodorant. I tried nearly everything in a privy, and only succeeded by using occasionally small quantities of dry clay loam. I took equal quantities of old putrid urine, and mixed severally with clay, sulphate lime, animal charcoal and wood charcoal. After a few hours the clay mixture alone was fully devoid of odor. It *destroys* or *absorbs* the foul odors, instead of partially overcoming them by substituting chlorine or coal tar in their place.

"The presence of clay has a great influence upon the health of communities. I have known many cases of typhoid fever and dysentery in this vicinity within a few years, nearly every one of which has been on a sandy or alluvial soil. Where the water used has filtered through a clay soil, there has hardly been a case of these diseases.

"There is another advantage in the country in using clay for privies. The removal of the contents is no longer a disgusting operation, while the farmer or gardener has a valuable supply of fertilizing material for his grounds.

"I believe that clay would be an excellent application to foul ulcers and other discharging sores."—(H. A. Sheldon, Middleburg, Vt., *Drug. Circ.*)

—

"*Economy of Light in Dark Alleys.*—If in a very narrow street, or lane, we look out of a window with the eye in the same plane as the outer face of the wall in which the window is placed, we shall see the whole of the sky by which the apartment can be illuminated. If we now withdraw the eye inward, we shall gradually lose sight of the sky till it wholly disappears, which may take place when the eye is only *six* or *eight* inches from its first position. In such a case the apartment is illuminated only by the light reflected from the opposite wall, or the sides of the stones which form the window; because, if the glass of the window is *six* or *eight* inches within the wall, as it generally is, not a ray of light can fall upon it. If we now remove our window and substitute another in which all the panes of glass are roughly ground on the outside, and flush with the outer wall, the light from the whole of the visible sky and from the remotest parts of the opposite wall, will be introduced into the apartment, reflected from the innumerable faces or facets which the rough grinding of the glass has produced. The whole window will appear as if the sky were beyond it, and from every point of this luminous surface light will radiate into all parts of the room. In order to explain the superior effect of roughly ground glass, let us suppose that the ordinary window is replaced with a single sheet of the best glass inserted flush with the outer wall. The whole of the light from the visible portions of the sky will fall upon its surface, but at such an obliquity that four or five-sixths of it will be reflected outward, and the other two or one-sixth, which is transmitted, will fall on the floor or on the shutters, and be of no value."—(Sir D. Brewster, *Chem. News*)

Capillary Chemistry.—The Paris correspondent of the *Chemical News* states that "M. BECQUEREL, Sen., read a third communication to the Academy of Sciences on capillary chemistry. He pointed out new facts of chemical decompositions taking place under the influence of capillarity, and he thought that he had proved that these truly curious phenomena were produced under the triple influence of affinity, capillarity, and electricity. To demonstrate the intervention of electricity, M. Becquerel has made the following experiment: he immersed his *split* bell-glass, containing nitrate of copper, in a second bell containing a solution of monosulphide, as in the first experiments; then he dips the two extremities of a silver wire, one into the nitrate and the other into the monosulphide. A constant electric current is formed: 1. The deposit of silver is made not in the capillary slit, but on the iron; 2. When the wire is removed the deposit is formed in the slit and on the edges along the side of the split bell-glass. The capillary action is as powerful as an electrical action. M. Becquerel continues to improve his experiments; for the split bell-glass he substitutes prisms of crystal glass pierced with a small hole; the slit or fissure is replaced by plates of glass with edges in contact, or even by sand; and he has thus obtained effects of silvering, gilding, platinizing, and very remarkable deposits of gold, silver, nickel, and cobalt."

Electro Deposition of Copper.—F. MOIGNO says (*Chem. News*) that "M. Bouillet has discovered a remedy for a defect in the electro deposition of copper, which is sometimes seriously injured, viz., its brittleness. He has found that a very small quantity of gelatin dissolved in the bath gives a copper of nearly equal malleability to rolled copper, whereas the pure bath only gives a porous defective metal like cast copper. The relative specific gravities of copper in different states are: cast copper, 8·78; laminated copper, 8·95; galvanic copper, 8·86. Gutta-percha moulds are exclusively used by the firm of Christophle & Co. They are applied, either cold by pressure with a lever, or by the hand. The mould is rendered conductive either by black-lead or silver, reduced from the nitrate by nascent hydrogen."

Spectrum Test.—"The extraordinary delicacy of the spectrum test in determining the presence of certain metals is well known to scientific men. Bunsen and Kirchoff intimate that it is possible to recognize in this way the sixty thousandth part of a grain of potassa or baryta, the one millionth of a grain of lime or strontia, the sixty millionth of a grain of lithia, and the one hundred and sixty millionth of a grain of soda. Dr. Letheby, the distinguished London chemist, has detected by these means the presence of blood in the stains on linen which had lain by for seventeen years."—(*Pacific Med. and Surg. Journ.*)

White Enamel for Gold Fillings.—A correspondent of the *Scientific American* "suggests to inventors that they study some way of affixing white enamel to the face of gold filling in teeth. I am confident that a fortune is awaiting somebody in that line. I will pay $100 to-day for a permanent enamel on my front teeth. They are filled on their face."

To harden Cast Iron.—"The simplest and best way that I know of to harden small iron castings," says J. W. JOHNSON, U. S. Armory,

Springfield, Mass. (*Sci. Amer.*), "is to heat them to a bright red heat, and then immerse them in common whale or lard oil. If the scale is taken off the castings, they will case-harden quite deep. I have seen quite a respectable cold chisel made from a piece of common cast iron in this way. The harder the nature of the iron, the better it will harden."

Solder with Zinc Amalgam.—The *Sci. American* states that "DEVILLE has lately made the observation that the addition of a little zinc amalgam to ordinary solder makes it applicable at low temperatures to aluminium bronze, cast iron, and also, no doubt, to other work in which quicksilver would not be objectionable."

"*A cement for attaching glass and brass* is stated to be prepared of excellent quality, by first forming a resin-soap by boiling three parts of resin and one part of caustic soda in five parts of water, and then mixing this with half its weight of plaster of Paris. This cement is said to be impervious to petroleum, only superficially affected by water, to adhere very strongly, and to be a bad conductor of heat."—(*Jour. Frank. Inst.*)

"*Soldering Liquid.*—Several correspondents have sent us approved formulas for this preparation:

"I. One part of chloride of zinc, two parts of chloride of ammonium, dissolved in sufficient water. Or,

"II. Metallic zinc (spelter) dissolved in muriatic acid *ad saturandum;* a teaspoonful of sal-ammoniac to be added to each four fluid ounces of the solution."—(*Drug. Circ.*)

BIBLIOGRAPHICAL.

The Half-Yearly Abstract of the Medical Sciences, being an Analytical and Critical Digest of the Principal British and Continental Medical Works published in the preceding six months. Vol. xlv. Jan.–July, 1867. Philadelphia, Henry C. Lea. $2 50 per annum in advance.

The mere announcement of the republication in this city, after a temporary suspension, of this standard English semi-annual should be sufficient to insure a large subscription. It affords a valuable summary of European medicine of especial value to those who have neither the time nor means to spare for a large number of publications.

The Humboldt Medical Archives. A Monthly Journal of Medical Sciences. Edited by A. HAMMER, M.D., and M. A. SALLEN, M.D., and co-edited by the Faculty of the Humboldt Medical College, St. Louis, Mo. Vol. i. No. 1. $3.00 per annum in advance.

This is a new and promising monthly for the advancement of medical science. As we heartily sympathize with all efforts to promote "rationalism in everything connected with medicine,"—one of its leading ideas, —we hope it may prove eminently useful in inculcating a higher standard of medical philosophy, and meet the success it merits.

The Physician's Visiting List for 1868. Philadelphia, Lindsay & Blakiston.

This well-known manual is issued in the usual compact and convenient form.

THE

DENTAL COSMOS.

NEW SERIES.

VOL. IX. PHILADELPHIA, NOVEMBER, 1867. No. 4.

ORIGINAL COMMUNICATIONS.

THE JAW OF MOULIN QUIGNON.

(An Essay read before the Odontographic Society of Pennsylvania.)

BY HARRISON ALLEN, M.D.,

PROFESSOR OF ANATOMY IN THE PHILADELPHIA DENTAL COLLEGE, AND PROFESSOR OF COMPARATIVE ANATOMY AND ZOOLOGY IN THE AUXILIARY FACULTY OF THE UNIVERSITY OF PENNSYLVANIA.

IN the latter part of March, 1863, a quarryman, working in the gravel pit at Moulin Quignon, brought to M. Boucher de Perthes an exhumed flint implement and a human molar tooth.

Moulin Quignon is near Abbeville, in the Valley of the Somme, in Northern France. M. de Perthes resides in its immediate vicinity. He is recognized as the pioneer and representative of modern archæology.

Although numerous evidences of man's workmanship in the shape of flint arrowheads, hatchets, and other tools had been discovered from time to time in these beds, nothing possessing a bony or dental structure had yet been detected. The announcement, therefore, to the veteran collector of such a fossil at last having been secured, stimulated him to renewed exertions as likely to furnish conclusive evidence of the great antiquity of man. On the 28th of the same month it was reported to him that another fossil had been discovered firmly imbedded in the gravel. He at once repaired to the spot and withdrew from the ground with his own hands the entire half of a human lower jaw, having the second molar in position. "The sockets of the other teeth were all present and filled with matrix, with the exception of the antepenultimate, the socket of which was effaced, the tooth having been lost during life. The solitary molar present was hollow from caries, and crammed with matrix." Near the jaw were found a hatchet, two other teeth, and a portion of a fourth.

Some time afterward fragments of teeth of the mammoth were picked up in the vicinity.

The position of the remains can best be understood by reference to the following diagram, displaying the beds of the quarry from above downward.

	m.
1. A bed of vegetable earth	0·50
2. Earth undisturbed, gray sand mixed with broken flints	0·70
3. Yellow argillaceous sand mixed with large or little rolled flints, superposed upon a bed of gray sand	1·50
4. Yellow ferruginous sand; flints smaller, and more rolled; below which is a bed of less yellow sand, with fragments of the teeth of *Elephas primogeneus*, and flint hatchets	1·70
5. Black argillo-ferruginous sand, coloring and sticking to the hand, appearing to contain organic matter; small pebbles, more rolled than in the higher banks; flints cut by hand; fossil human jaw	0·50
	4·90

6. A bed of chalk, upon which the bed of black argillaceous sand rests, at a depth of five metres below the surface.

It will be perceived that the specimen laid about nine feet from the surface and beneath the tooth of the now extinct mammoth.

In order to fix the value of the specimen, several of the most distinguished French savants, together with Drs. Carpenter and Falconer, of London, were invited to examine the jaw and inquire into the circumstances under which it was found. They met at Abbeville, and after careful deliberation, declared it to be their opinion that the deposit had not been disturbed, and that the specimen was undoubtedly fossil. M. de Quatrefages, of Paris, soon afterward communicated these affirmative results in a memoir to the French Institute.

Dr. Falconer, however, upon renewing his studies of the jaw, in which he was now assisted by Messrs. Tomes and Busk, began to entertain doubts as to the antiquity of the bone, and communicated his suspicions to his co-laborer.

"Men of science in France and England were thus suddenly placed at direct issue on a grave and important point of great general interest. But happily from the frankness and rapidity of the communications interchanged, there existed the most cordial relations, and the conviction of loyalty and good faith on both sides. As a wordy discussion would but have wasted time and must have been protracted, and as a personal conference held out the best prospect of a speedy settlement of the question, a *reunion* of men of science, to be held in Paris, was proposed by the French savants."*

Accordingly a second Congress of scientists met at Paris and Abbeville,

* Nat. Hist. Review, July, 1863, 425.

when the specimens and the localities were again subjected to renewed and severe examination. The conclusions arrived at were as follows: 1st. That the jaw had not been introduced surreptitiously into the quarry of Moulin Quignon. 2d. That the jaw was cotemporaneous with the flints and the bed in which they were found. 3d. That the flints found with the jaw were nearly all authentic.

These were acceded to by those present excepting Drs. Busk and Falconer; the former declaring it to be his opinion that "the internal condition of the bone was irreconcilable with an antiquity equal to that assigned to the deposits;" and the latter, that "the characters which the jaw presents, taken in connection with the conditions under which it lay, are inconsistent with said jaw being of any great antiquity."*

Here the matter rests. The French anatomists being willing to assign the jaw to an antiquity coeval with the men who framed the flint hatchets,

Fig. 1.

Jaw of Moulin Quignon.

and whom they believed to have lived on the same plains with the extinct mammoth; the English representatives, in part, concurring with the belief in the authenticity of the specimen, but from "the characters" of the fossil declining to yield to it any remote antiquity.

Now, what are the characters which the jaw presents?

By reference to the rude outline engraving (Fig. 1), (the only one we believe as yet published), we recognize the body and ramus of an adult

* For further account of this subject, see an admirable resumé of the facts by Dr. J. Aitken Meigs (*Amer. Journ. Med. Sci.*, xcii. N. S., Oct. 1863, 475), as well as several papers in *Anthrop. Review*, vol. i. 1863.

lower jaw—of which side is not stated, though probably of the right. The mentum is seen to be well defined; ramus reclinate, low and small compared to length of body; sigmoid notch, shallow; anterior edge of coronoid process, uneven; posterior part of the body constricted at the point of union with ramus, and the external aspect of the condyloid process thicker than usual antero-posteriorly. To these features, which at once pronounce themselves, may be added those mentioned by Dr. Falconer,* that the condyle is unusually globular, and the angle is turned markedly inward; and those by M. de Quatrefages,† that a sulcus exists upon the outer side, extending almost as far as the chin; "that the lower and inner edge of the head is very slightly marked,"—and "that the head is perhaps more rounded and broader outwardly than in ordinary specimens."

M. de Perthes, in speaking of the discovery of the bone, says: "At first sight the jaw appeared to me to present certain differences from an ordinary jaw. M. Jules Dubois, physician to the Hôtel Dieu at Abbeville, and M. Catel, surgeon-dentist, a good anatomist, to whom I showed it, made the same remark. M. Jules Dubois found that the ascending branch was more oblique from back to front than in a man of our day; and that the condyle itself is distorted in the inside and somewhat low. His conclusion was that this man belonged to another race than ours. His confrere, Dr. Herquet, known, like M. Dubois, by his excellent memoirs upon natural and medical science, shared this opinion, adding that the difference from the ordinary form might be an anomaly, but that it was so decided as to deserve attentive consideration."

It is in relation with this paragraph that we will be more particularly engaged; and, in the absence of the original specimen, or a cast of it, to ascertain by comparisons among numbers of lower jaws the accuracy of some of its statements.

For the sake of convenience, we will place the conclusions of M. de Perthes and confreres in the form of interrogatives, assuming that they remain to be proved.

I. What is the pattern of an "ordinary" jaw?

II. What is the value of the lower jaw as a test character of race?

I. *What is the pattern of an "ordinary" jaw?*

The descriptions of the lower jaw, as given in standard works, are too brief to be employed in deciding this question. Those in monographs on the bony framework, as Holden's Osteology, Ward's Osteology, Humphrey on the Human Skeleton, are comparatively meagre, none of them, indeed, indicating that they had been drawn up from comparisons of numbers of specimens; while from the text books, with the exception of the description in Knox's Cloquet, the special points of

* *London Times*, April 25, 1863.

† *Anthropological Review and Journal*, vol. i. 312.

variation are entirely, though doubtless very properly, omitted. It was necessary, therefore, to resort to the bones themselves. For this purpose the anatomical collections of the University of Pennsylvania, College of Physicians, Philadelphia Dental College, and the very fine Morton Cabinet in the Museum of the Academy of Natural Sciences, were visited, and examinations made of all the lower jaws that were available.

These sources furnished 400 specimens. From this number the immature and aged were afterward excluded, as well as many other specimens of the Morton Cabinet, where particular regions were often found so mutilated and otherwise deteriorated by exposure and inhumation as to be of no value for comparison. After these deductions the number of perfect adult bones remaining was about 300.

It is not proposed to give the results of all observations. Some proved to be nearly negative; others, a smaller number, are thought to be of greater value. The former will be passed over. The latter will be briefly spoken of—commencing with the posterior part of the bone and proceeding forward.

1. Condyloid process and neck.

The ramus of the lower jaw is generally described as terminating superiorly in two processes, separated by an intervening space. The anterior of these is the coronoid, the posterior the condyloid process, and the intervening space the sigmoid or semilunar notch. The condyloid is divided into a neck and articular surface. The neck is very constantly compressed from before backward, concave anteriorly, convex or straight posteriorly, and is thicker externally than internally. The articular surface is arranged with its longest diameter across the neck, but presents numerous variations with respect to its shape, position, and relative size to its fellow of opposite side, and with the rest of the bone. So far as is known, authors have altogether omitted to mention many of these points, and some confusion exists regarding others.

Thus it is said:

"This articular surface is transversely oval, convex, covered in the recent subject with cartilage, and *inclined from within outward* and a little forward."—R. Partridge, art. Face, *Todd's Cycl. Anat. and Phys.*

"The slight elevation of their inner extremities, adapted to corresponding depressions in the glenoid cups, form a sort of lock."—*Humphrey.*

"The condyle is of an oval form, its long axis being transverse and placed in such a manner *that its outer end is a little more forward and a little higher than inner.*"—*Gray.*

"The condyle is convex from before backward, and from side to side, and set obliquely on the neck, in such a manner that its outer extremity rises somewhat higher than the inner, and is also turned a little forward."—*Ward.*

"The direction of its axis is oblique, so that if prolonged it would meet with that of its fellow of the opposite side at the anterior margin of the foramen magnum."—*Quain.*

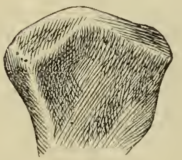
"The condyle is curved forward, and most convex in that direction; its long axis is transverse but is directed obliquely backward and inward, so that its internal extremity is posterior; *it is also higher than the external;* its posterior surface is nearly straight or flat, and almost free from cartilage."—*Harrison.*

"Its direction is a little *oblique from without inward* and from before backward, so that the two articular surfaces convex toward each other backward."—*Meckel.*

"The superior and posterior angle constitutes the condyle and is placed from above downward and from without inward."—*Bourgery & Jacob.*

When the eye is brought on a level with the articular surface of a lower jaw, it always presents a degree of angularity, *i.e.* from an intermediate elevated point between the inner and outer border of the condyle two more or less well defined planes incline. In about one-fourth of the number examined this angularity was very marked; in more than one-half it was evident, and in the remainder—some 30 specimens—it was almost entirely obliterated.

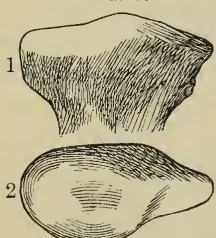
Fig. 2.



Right condyloid process of lower jaw of Anglo-American,—showing marked angulation.—*No.* 1108 *Morton Coll.*

The point at which the inequality originated was nearer the external than the internal edge of the surface (Fig. 2). Sometimes nearly in the centre, it was commonly at the outer third. The inner plane was more convex than the outer, generally less abrupt (sometimes really inclined upward), and was either rounded upon the inner border of pterygoid fossa, or terminated more acutely in it. The outer plane was smoother, broader than the inner, facet-like, and defined by sharp borders anteriorly and externally. While inclined downward and outward it was at the same time thrown downward and forward. Its surface was either plane or concave, rarely if ever convex. Its structure was more compact than that of the internal, presenting an eburnated appearance. In some specimens, namely, those with slight degree of angularity, it presented insignificant proportions, but in others (Fig. 3) it was by far the most conspicuous feature in the condyle.

Fig. 3.



Right condyloid process of lower jaw of North American Indian.

1. Anterior view.
2. View of articular surface from above.—*No.* 1509 *Morton Coll.*

These points tend to show that the condyle, during the motion of the jaws, is subject to more attrition upon its outer than inner portion, a conclusion apparently confirmed by the greatest development of this facet being seen in the jaws of fully matured individuals, and in its excessive obliquity in many jaws of the aged. So marked is this latter

feature, that many such specimens present at first sight but one plane, that being strongly inclined outward and downward. The external third of the articulation appears to be the true grinding surface, the inner portion constituting, indeed, in some specimens, but the rounded superior border to the fossa for the insertion of the external pterygoid muscle. It will already have been perceived that the inclination of the condyle is by no means constant. Not only is there great variation in its transverse direction, but the articular surface may be inclined either inward or outward, as the external plane is very slightly or very much worn. Of the former 40 mature specimens were met with, and of the latter 47. In many instances neither direction could be said to predominate, the tendency being, however, to an inclination outward.

These characters gave the articulating surface a pyriform appearance —the base of the figure being outward, the apex inward (Fig. 3). This indeed may be taken to be a distinctive configuration of the adult bone, only 8 specimens being seen where the inner portion was thicker, or as thick as the outer. In the young bone, on the other hand, the proportions are reversed.

Very commonly conjoined with the thinning of the condyle internally was a compression of the entire process antero-posteriorly. This was much more marked along the inner than outer aspect, and was at times associated with a concavity on posterior surface of the condyle, which was probably in relation during life with the insertion of the capsular ligament. This concavity was markedly seen in 20 instances.

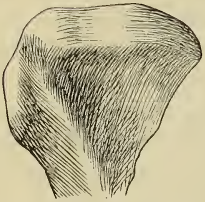
Situated along the external portion of the process, and pertaining to the neck quite as much as the condyle, was seen a feature comprised in a diffuse convex thickening. It existed as distinct from the form of the articular surface, and gave an appearance to the parts of being tilted forward.

The process, as a rule, was developed laterally, the degree of such extension being dependent upon the size of the pterygoid fossa, and, all things being equal, to the size of the ramus. But the degree of deepening of this fossa was subject to great variation. It was with some wide and deep (Fig. 2), and from this extreme every shade of intermediate depression to the other where the concavity was barely evident. This form was united generally with a condyle developed in height rather than width, having the outer facet obscure, the inner plane thickened and inclined upward, and the process thickened from before backward. It gave the condyle a "globular" appearance, and is probably the variety described by Falconer as present in the Abbeville jaw. This phase of development marked but 8 specimens.

Upon the outer border of neck, just beneath the articular surface, giving attachment to the external lateral ligament, is seen a small prominence known as the *tubercle*. It is not mentioned in many works on anatomy,

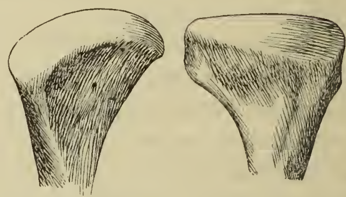
although an interesting and curiously shifting character. It was acuminate, with a sharp inferior ridge gradually running into the side of the process in the young bone; defined small, wartlike, with a depressed

FIG. 4.



Right condyloid process of lower jaw, showing large cancerous tubercle.

FIG. 5.



Condyloid processes of lower jaw of an Oneida Indian.

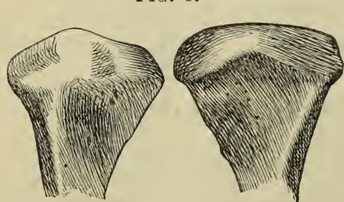
1. Right side, inclined outward with both degrees of angulation obscure.

2. Left side, nearly level.—*No.* 33 *Morton Coll.*

centre, common with those processes having little angulation; oblong, thick, irregular in a few massive bones with bold muscular impressions (Fig. 4.), and thin, trenchant with the free edge turned forward, forming a well-defined groove between it and the line of semilunar notch in aged specimens. In some of the latter group this groove continued down the side of the ramus parallel with the notch.

It was not always necessary to compare the condyloid regions of two bones together to detect the differences above mentioned. They often

FIG. 6.



Condyloid processes of lower jaw of Indian from mound in Ohio.

1. Right side, thick, "chunky."

2. Left side, compressed, widened.—*No.* 1271 *Morton Coll.*

FIG. 7.

Condyloid processes of lower jaw of Chinese.

1. Right side, compressed internally with deep pterygoid fossa.

2. Left side, thickened internally, with shallow fossa.—*No.* 427 *Morton Coll*

subsisted upon opposite sides of the same bone. Then the right condyle would be at times nearly level, wide, compressed, with large tubercle, while the right would be angular, chunky, and thick, with little or no tubercle (Fig. 5). Indeed, differences in size and shape between the two sides was very common, and few processes were found exactly similar, part for

part (Figs. 6 and 7). From 171 specimens examined upon this point, 42 had the left condyle largest; 54 had the right the largest, and the remaining 75 were of about equal areas. The smaller process was oftener more inclined outward than the larger, was more depressed, and the whole side appeared to be, though not measured, actually shorter than its opposite.

2. *Semilunar Notch.*—This was commonly shallow, of an irregular curve, the portion upon the condyloid side being more pronounced than that upon the coronoid. It was rarely deep—V shaped—this variety being seen only in about one-twelfth of the whole number examined.

An interesting feature was seen in the manner in which this bone joined the condyle. It ran into the articular surface at one of four points, varying from the middle of the area to its outer edge. Thus, from 140 examples, in 29 it joined it at its outer third (Fig. 3), in 32 at its outer fourth, in 32 at its outer fifth (Fig. 6, R), in 46 at its outer edge (Fig. 6, L). As a rule, the point of union was similar on the two sides, but in six marked instances it varied—one side having it at outer third or fourth, the other at edge. In one specimen only was the junction directly in the middle. In no instance did it appear to hold a relation to the site of angulation.

3. *Angle.*—The angle of the jaw was seen to be large, broad near a right angle, and with scarcely any constriction at the junction of ramus with body; or small, narrow near an obtuse angle, with marked constriction evident. The external border was often placed outward, and more rarely turned inward. This last has been termed the "marsupial" tendency, by Dr. Falconer, from the remote resemblance it bears to the inflexed process which extends from the angle of the lower jaws of Marsupial mammals.* This was found present but in 20 specimens. It is described as being present in the Abbeville bone.

4. *Coronoid Process.*—This was always turned outward. The variations to which this was subject were seen in the degree of thickening from within outward, the process being heavily ridged to within a few lines of apex, or more slender and compressed. At times the anterior free border was wide and thick, but more commonly sharply edged.

5. *Foramina.*—A few well-defined foramina were frequently found in the upper part of the pterygoid fossa. A small elliptical foramen was present in a small minority of cases upon surface of semilunar notch near its junction with the condyle. The inner surface of the coronoid process was furnished in many cases—more particularly in young adult bones—with numerous aggregated openings. The dental foramen presented few variations in appearance. Very frequently surrounded by one

---

* It is well marked in our common opossum.

or two spiculations, it was at times entirely defined by a smooth, thick opercular border.

The mental foramen, however, presents a number of mentionable points.

The usual direction of the foramen was slightly oblong and oblique from behind forward. The inferior border of foramen in the great majority of cases was well defined and placed external to the superior, which gradually emerged into the posterior wall of the canal. In three instances it was double on one side, two of these being on the left. The holes here were smaller than when united, and were placed obliquely one above the other, separated by a line or two, the inferior one looking downward and backward. In six specimens the foramen was very large, though not appearing to be the result of diseased action. With these it averaged the size of a pea, was not oblique, had rounded apertures, both superior and inferior walls being equally trenchant. In one the large foramen was associated with double foramina upon opposite side. The size of the foramen bore no relation to the size of the jaw, for in the more massive specimens it was no larger than a pin-head, while in others—some of them immature—it was remarkably large.

The mental foramen bore a constant relation to the base of the jaw, though that to the alveolar margin varied greatly with age. In the jaw fully furnished with teeth, the hole was nearly midway between the two planes, being nearer the inferior margin by about an average length of a line. But in those specimens in which, through loss of teeth, the alveoli had become absorbed, the superior margin approximated the foramen, and in edentulous specimens from the aged, appeared to include it upon the gingival surface.

The position of the foramen in 321 specimens was found to vary as follows:

On level of first bicuspid, 6.

Between first and second bicuspid, 64.

On level of second bicuspid, 86.

Between second bicuspid and first molar, 159.

On level of first molar, 5.

Between first and second molar, 1.

In a few instances the foramen was placed differently on the two sides; thus, between first and second molar on the right, and on level of first molar on the left.

Such are some of the characters presented in a series of healthy adult lower jaws—characters many of them difficult to interpret, and impossible to set into formulæ. When scarcely two bones can be found alike, and the two sides of the same bone, it may be, are markedly dissimilar, it would at least be simply ingenious to frame a description that could apply to all. The expression, "ordinary jaw," then, is seen to be ex-

tremely vague. No character of the Abbeville jaw, when compared to those just given, can be said to be more than ordinary, though the globular head and the inversion of the angle are unusual.* Mention of the conformation of the condyle is omitted in the published descriptions, and the really extraordinary character apt to occur, namely, the asymmetry between its sides, remains from necessity unproved. It is by no means improbable that the lost half of the jaw presented some features at variance with those of the right. So that while this side is described by M. de Perthes as of extraordinary appearance, the opposite, were it known, might yield characters of but ordinary value.

The lower jaw is, perhaps, the most peculiar bone in the body. Developed from membrane at a very early age, it is homologically the persistent branchial arch, now subserved to the extraordinary function of being an accessory to the development of the teeth. For seven months it is little else than a sclerous matrix for the accommodation and protection of these special capsules, and partially so until the end of the eighteenth or twentieth year. It is, in a word, a tooth nursery; and, during process of development and evolution the odontic element is the dominant power determining the size and contour of the bone. Nor does this influence cease when the permanent set has been entirely erupted. The development of the muscles of mastication may, it is true, fashion the shape of the bone. Yet even these can be, and are so directly influenced by dental changes, that they, perhaps, more than any other agents, are instrumental in maintaining the deviations originally effected by the teeth themselves. Thus an aching tooth on the left side will induce mastication to be performed upon the right. If this be necessitated for a sufficient length of time, the muscles of that side will become, in consequence, developed, and their impressions upon the bone deepened. The condyloid process will likewise be increased in size, while the articular surface will be worn off upon its outer half. But no such change will occur on the left. The loss of a tooth on one side will cause absorption of the alveolus, and most likely will modify the position of the teeth on either side of it. Loss of all the teeth of the same side will not only produce absorption of the alveolar ridge, with subsequent reclination of the ramus, but also, from comparative quiescence of its muscles, alteration in the shape of the condyloid process. Between these extremes—the loss of one tooth and that of an entire series—every degree of lesion may occur, affecting the contour of the bone proportionally to the extent of the injury. In the majority of the specimens examined, showing asymmetry in a marked degree, loss of molars was constant on the side least developed.†

* It should be mentioned that the degree of inversion of the angle when present was always equally expressed upon either side.

† It is proper to say, however, that a few of the contrasts were seen in jaws

II. *What is the value of the lower jaw as a test character of race?*

From the opinion expressed by MM. Dubois and Herquet, we would be led to expect some trenchant characters in the lower jaw by which the position of the individual among the races of men could be without cavil determined. It is true that, to a certain extent, the shape of the jaw is indicative of ethnic identity. Thus, in the negro, the chin is receding, the angle is open, the ramus low, and the alveolar ridge inclines upward and forward. In the North American Indian, the body is ponderous, and truncated in front, while the ramus is broad and square. In the Malay, the chin is straight, and the body, compared to the upright ramus, small; and in the Caucasian, the chin is produced and the ramus obtuse. But these characters are found to lose their distinctiveness when many specimens are examined—not to the extent of disproving the correctness of the general observation, but just enough to prevent it being used as an absolute test. Any character or group of characters pertaining to a single bone proves fallacious when used in framing general conclusions. The form of the occipital condyle, the shape of the anterior nares, have, in this way, been accepted, but afterward abandoned. The contour of the occiput, as enounced by Morton, has proven, in the elaborate examinations of Dr. J. A. Meigs, to be of greatly restricted value.

In this connection M. de Quatrefages on the Abbeville Jaw, Anthrop. Rev., vol. i. 1865, 312, in speaking of the specimen in question, has said: "The openness of the angle is one of those characters which are liable to variation on account of age and other circumstances, apart from individual peculiarities. I found that in an Esquimaux skull the angle was, perhaps, more open than in the Abbeville jaw, while in another head of the same race it was nearly straight. I have found, besides, in various races, examples of equally obtuse angles, and of analogous variations. A new examination and exact measurements taken on various individuals of different ages and races are here necessary."

Certainly, in the present state of our knowledge, it would be rash to assign the Abbeville man to "another" race, or, indeed, to any particular race, by the meagre evidence left us in a fragment of his jaw. In the absence of the proper investigation suggested by the above authority, and with examples before us of serious errors having been committed by too hasty an application of isolated tests, we think we are justified in concluding that the lower jaw is of little value, ethnologically speaking, and is only of importance when considered together with cranial characteristics.

---

furnished with full sets of regular teeth. It is possible that causes not susceptible of study in the dry bone may occasion changes similar in their effects to those brought about by loss of teeth.

CELL AND OTHER GERMINAL FORMS.

PHYSIOLOGICAL AND PATHOLOGICAL HISTOLOGY.

BY PROF. RUFUS KING BROWNE,

PROF. OF EXPERIMENTAL PHY. AND MIC. ANATOMY NEW YORK COL. OF DENTISTRY; PROF. OF PHYSIOLOGY AND HYGIENE NORMAL SCHOOL OF PHY. CULTURE, BOSTON; FORMERLY PROF. OF PHY. AND MIC. ANATOMY NEW YORK MEDICAL COLLEGE.

THE older histologists were persuaded that there were various kinds of cell-productions and growth. They described three, and suggested others. A brief sketch of the essential points of the several doctrines of cell-production, as they appeared from time to time in its history, will enable those whose readings and observations have not familiarized them with it, to understand the present views of cellular growth in normal or abnormal tissues.

Raspail, in 1833, was the first to describe the characters of form of the cell, and to offer an account of the process of its formation, which he likened to crystallization. He described them as arising in "a liquid tending to *organize.*" He ascribed to this fluid a *formative* or *generative* capacity. This erroneous idea of the cell-generating capacity of a plastic substance became that of Schleiden and Schwann. But Raspail had done little more than formulize the imperfect observations which had accumulated in the era preceding him.

We are indebted to Schleiden, the botanist, for the first series of observations upon which was based a definite (though mistaken) theory of cell-development.

Schleiden studied the process of cell-development presented in the embryonic stage of vegetable growth within the capsules which contains the albuminoid substance of the seed, and also at the extremity of the pollen-tube, from which the embryonal growth arises. He represented that in both these situations a plasmatic substance exists, which first assumes a turbid and afterward a granular aspect. Within this area these granules unite at several points *to form* nucleoli; next, surrounding each of these, are formed nuclei (cyto-blasts), and subsequently cell-wall, and contents surrounding the two former. According to this account, the process consisted in each cell arising separately out of the plasmatic substance, and no one of them took part in the reproduction of others. This process is historically known as free cell-development. It was, until recently, accepted as the mode of cell-formation in pathological formations.* The same view was once also held undoubtingly with regard to normal tissue-growth.

Schwann followed Schleiden, and made his observations upon the em-

* "Free cell-formation is exceedingly frequent in pathological productions, and the cells in pus and in exudations of all kinds arise in this manner; in fact, all pathological cell-formation properly comes under this head."—*Kölliker*, *Mic. Anat.*

bryonic animal tissues. He had accredited Schleiden's theory of cell-production. In his examination of embryonic animal tissues, Schwann observed innumerable cells situated in a more or less consistent intercellular substance, and these he supposed to have been produced as previously announced by Schleiden; and though Schwann was original in his account of the building up of the tissues, by which, subsequent to the origin of the cells, these are transformed into the completed structure, he assigned to the production of the cells of animal tissues, the same mode of origin Schleiden had ascribed to cells of vegetable tissues. This mode of cell-origin or generation in physiology, was likewise accredited by Johannes Müller, in his classification of pathological formations.

Müller was the first to show that both normal and abnormal tissues are produced under the same law of growth; but, adopting Schwann's doctrine as to the origin of the cell-elements, his own observations were made with reference to the processes of their transformation into either the abnormal structure, or into degenerate morbid products.

The doctrines of Müller in abnormal tissue-growth were credited by Vogel, Lebert, Rokitansky, Paget, and others. None of these reinvestigated Schwann's and Schleiden's theory of cell-production, and their researches were limited to the investigation of the various stages of transformation after the cells had originated from the "blastema," by which morbid tissues were formed.

But while the train of pathologists were accepting Schleiden's theory unquestioned, and had accumulated their stores of observation in accordance with the erroneous presumption of free cell-production, the botanists, observing normal vegetable tissue, were reinvestigating cell-growth.

In 1844, Von Mohl issued his account of the formation of cells within plants. He affirmed that the production of new cells in plants occurred only in the interior of other cells (plant cells). His account of the order of formation of the cell was unlike that of Schwann. "Not the nucleolus appears first," he says, "but the nucleus or cytoblast." Von Mohl was soon followed by investigators into the origin of animal tissue, who objected to other points of Schwann's cell-doctrine.

At length, in 1852, Remak unreservedly rejected Schwann's doctrine of free cell-development, and announced the theorem, which became the leading doctrine of Virchow, "*Omnis cellula a cellulâ.*"

Virchow thus illustrates this doctrine: "Just as little as we can now admit that a tenia can arise out of saburral mucus, or that out of the residue of the decomposition of animal or vegetable matter, an infusorial animalcule, a fungus, or an algæ can be formed, equally little are we disposed to concede, in physiological or pathological histology, that a new cell can build itself up out of any non-cellular substance. Where a cell arises, there a cell must previously have existed (*omnis cellula a cellulâ*), just as an animal can spring only from an animal, a plant from a plant."—*Cellular Pathologie.*

This doctrine is now accepted by modern histologists, and completely supplants that of Schwann entire; and although Virchow was not the first observer to propound it, he has brought to its illustration such a wealth of observation, and has applied it in such sweeping elucidation of both normal and pathological tissue-formation, especially the latter, that he is fairly entitled to the credit of being its ablest expositor.

It is evident that, without vacating the theory of free (spontaneous) cell-production from a supposed formative (non-cellular) substance, plastic lymph, or cytoblastema, no radical or important change of our view of morbid products or pathological formations could have been reached. The true production of the cellular elements, in the first instance, was the most indispensable part of a correct understanding of either normal or abnormal tissue development; the tissue in its completed and constructed stage being nothing more than the transformation of these cellular elements from stage to stage of their origin and career.

Up to the day of Virchow, pathologists had unquestionably supposed all pathological developments to have been, in the first instance, a blastema or plasma transuded from the vessels of the diseased parts, and that this was developed by its own formative quality into the cellular growth which constituted the new formation, while the degeneration or breaking up of these histological forms constituted the final stage of the morbid products, as in pus, etc. Instead of these formations being by free (or spontaneous) cell-development from the plastic lymph or blastema of Schwann, or the exudation of the early pathologists, Virchow first demonstrated that morbid tissues arise from excessive multiplication by division and growth of the cellular element of connective tissue—"the connective tissue corpuscle" or "plasmatic cell." He showed that this connective tissue, with its cellular elements or "corpuscle," abounds everywhere in the human organism, and enmeshes all the other histological elements. Its different varieties abound profusely in the brain, liver, kidneys, cartilage, and even the skin and bone; whatever morphological changes its cellular elements undergo, they constitute the growth of pathological formations, which are but an abnormal development of the cells of connective tissue, or a subsequent degeneration of its elements.

But let us look a little more closely at Virchow's understanding of this connective tissue, and thus be helped to a completer understanding than without it, of the function of "cells,"* or their equivalents, whenever and

* This cellular element of connective tissue, called by him the "plasmatic cell," is Virchow's own discovery and he has given the first exposition of its nature and histological relations. He shows that all or nearly all the morbid formations or structures arise within the connective tissue by the perverted growth of these "plasmatic cells," and he makes it evident how, by the abundance of this tissue everywhere in the body, pathological formations of the same character arise in different organs, since the same producing cellular elements are equally present in the most widely separated organs.

wherever they arise in the growth and life of an organism. We shall find that the histogenesis of this tissue turns out to be related in the closest possible manner to physiological as well as pathological histology. Before the time of Virchow, connective tissue was supposed to be the most unchanging tissue in the body. It was said to consist of (1) white fibres, (2) yellow *elastic* fibres, in close combination with pigment-cells and fat-cells.

According to Schwann, the fibres (of two kinds) of connective tissue are transformed from cells of the simplest form. These assume an elongated shape, *then fasten or conjoin end to end*, assume the consistency of fibres, and afterward split in parallel lines *within the body of the cell.* Subsequently they split into distinct fibrils, so that each row of cells, thus mutually attached by their extremities, is developed into a bundle of connective tissue.

The white fibrous bundles are sometimes described as non-cellular fibres in very intimate conjunction with an amorphous interfibrillar material, and at other times, as this latter material disposed in such a way as to present a fibrillated appearance, though not actually capable of separation into distinct fibres. But these accounts are erroneous; and notwithstanding connective tissue, from the date of Schwann's researches, has been the object of a host of investigators, Virchow was the first observer to give a complete account of its mode of formation, and the character and history of its elements.

According to Virchow, the connective tissue consists of (1) the white bundles; (2) elastic fibres; (3) the "connective tissue corpuscles" or cells, and an intercellular substance—the same which Schwann reported to be the blastema from which the cells were generated. The white bundles (1, fibres) arise from the direct fibrillization of the intercellular substance; and while this is taking place, *some* of the cells are transformed into (yellow) elastic (2) fibres; others change to fat and pigment cells, while many others of a more or less stellate shape remain, as the peculiar cellular elements (3) of the tissue. These cellular elements are the essential anatomical element of connective tissue. They are sometimes fusiform, but more frequently star shaped or stellate, and united by means of branching prolongations, so as to form a network similar to the structure of bone, the corpuscles and canaliculi of which are really cellular, consisting of the same elements greatly transformed. The elastic fibres result from a peculiar change and sclerosis (hardening) of the walls of the cells, which terminate in a disappearance of the cell contents and the obliteration of their cavity. The whole series constitutes the connective tissue, which we see consists of a variety of tissue, produced from a *germinal element of one and the same form.* By their capacity of increase of number and growth by division and multiplication, these (plasmatic) cells of connective tissue produce all pathological growths.

Their mode of *generation by parentage* is the only mode which the higher order of histologists now recognize as the manner of cell-production, whether in the earliest or latest stage of growth of tissues—whether in physiological or pathological histology.*

In but one particular does this account of the formation of connective tissue fail in a completely accurate description. The received description of the formation of the cellular portion of this tissue is, that the cells commence the anastomosing network by protruding branching processes which *join themselves* to similar processes, prolongations of adjacent cells. But in reality, abundant observation has convinced us that, at first, the brood of cells are not *apart*, but lie in the *closest* contact as undivided in *substance*. They are the progeny by division of *one mass*. As each of the divisions stretch away, or diverge from their lines of division, their substance is still connected by minute, narrow isthmii, the elongation of which forms the fibrous portion of the anastomosing network. Notwithstanding that we believe with Virchow, that in all cases cellular elements must have existed where cells were found, yet it is known that masses or particles of matter take part in the formation of tissues, which do not consist of a cell-wall, contents, nucleus, and nucleolus. In many tissues, where a belt of matter surrounds or embraces (corresponding to "cell" contents) the nucleus, there is no cell-wall inclosing it; and frequently minute masses of germinal matter, corresponding to a nucleus, without a nucleolus, or other features, can be seen taking part in the formation or building up of tissue. So that it is certain that bodies may build up and become incorporate in tissues which have no cell wall nor contents interiorly. Nothing can be more specifically contradictory than different sections of the view of the same author, respecting the physiology of the cell, and also of different authors.

Virchow says: "It is not the constituents we have hitherto considered (membrane (cell-wall) and nucleus), but the contents (or else the masses of matter deposited without the cell,—*intercellular*), which gives rise to the functional (physiological) differences of tissues." It is the other

---

* Virchow's account of the process of cell reproduction, or as he very aptly terms it "proliferation," is as follows:

"The cellular elements enlarge, and then exhibit further changes, which begin in the interior of the nuclei. The nucleoli become remarkably large, sometimes oblong, and sometimes staff-shaped. Then they become constricted in the middle, and assume the form of a finger-biscuit, and *two* nucleoli appear. About such a divided nucleolus, the finger-biscuit like constrictions and afterward the real division of the nucleus also takes place. This may be repeated so that three or four nuclei arise. If now we advance a step further in these processes, we come to the new formation of the cells themselves."—*Cellular Pathologie*, p. 310.

This is an example of true cell production, or proliferation; being the exact mode in which groups or "broods" of many cells arise in morbid growths.

contents, not the nucleus or cell-wall, which occasions the physiological action of parts. And yet Virchow says that the nucleus is concerned in maintaining and multiplying the living parts. Huxly adopts a modification of Wolff's cell theory. He supposes that, originally, a clear, homogeneous plasma is produced, in which minute spaces (vacuoles) are formed, and these contain, in the interior, the *endoplast*, consisting in fact of the primordial utricle (1) of the vegetable cell; the cell contents (2), and the nucleus (3). According to him, the *walls* of these spaces are composed of the original plasma altered, which is termed the periplast or periplastic substance. The greatest importance is attached to the periplast. It is supposed to possess the active power of growing in and forming partitions, when division of the *endoplast* occurs, and of becoming differentiated into very important structures. This intercellular or periplastic substance is supposed to be very important. And yet the same author goes on to say: "The periplast, on the other hand, *under the names of cell-wall, contents, and intercellular substance*, is the subject of the most important metamorphic processes."

Seeing, then, that only cells, and not "plasmatic" substance, produce cells, and that it is only *by* cells, and not by any "spontaneous" mode of genesis, cells are produced, and seeing that cells or germs, and their transformations during the progress of age, *together with* the transformation also of the intercellular material in which they work and grow, constitute the grown form of all the tissues, having a structure in the organism, let us define what a cell *is*, and more closely depict what the process of production consists in.

A "cell" is a minute body, either roundish, oval, spindle, or star-shaped. When wholly separated from intercellular material, it consists of an outer surface of *membranous* density and consistency or coherence (cell-membrane, cell-wall), *continuous* in substance with a zone or belt of substance within called cell-contents, which surrounds a minute rounded body, the nucleus, which surrounds and imbeds a second and much more minute dot-like body, the nucleolus. The whole is the body from which cells are produced. The process of production consists of *increase* by division. This increase is both of numbers and mass. The production is not exactly parentage in the usual sense. It consists in a cell dividing in halves; each half divides in two; each quarter divides in two; each eighth divides in two, and so on. The increased numbers are therefore so many minute masses or cells which one cell has partitioned into. This is called "cell" proliferation, and the increased numbers are called the "progeny" of the parent mass or "cell."

At first these minute masses are in exact contact, but in the process of formation of tissues they move or diverge from each other. During the division there is a process of *growth* going on, so that the increased number of cells is larger than the parent cell. *These cells do not arise sep-*

arately one from another, and hence in all their subsequent transformations they do not become disunited, except by disintegration.

From the transformation and movements of these masses, *together with* changes in the material between them, are constituted or built up all the tissues, however complex their arrangement, of an organism.

They are the builders of the tissues—of whatever character. But we must reserve for some future occasion an account of these tissue-building processes, the true natural history of which it was only recently we have come to understand.

Many of the books on minute anatomy were written on the basis of the old theory, and will have to be rewritten.

[In 1863–64, in the pathological department of the University of Berlin, under Virchow, I became more thoroughly acquainted with the learning pertaining to cell pathology, of which his mastery is so remarkable. Virchow is an epoch-making author. His pathological doctrines mark the opening of a new era in that department of scientific research. "Cellular Pathologie" furnishes an account of the intimate anatomy and the physiological and pathological relations of the nervous system, and a classification of other normal tissues; of the subject of nutrition; of fatty, amyloid, and other forms of degeneration. We record our conviction, that at no time has a doctrine in medicine, with scientific pretensions at all to be compared to those of "cellular pathologie," appeared. Nothing can exceed the easy mastery Virchow has shown over the details of all the subject, nor the evidence of his ability to cope in a truly scientific manner with the great problems he has encountered. At every step he has transcended the rôle of the mere observer with a barren accumulation of sensible fact, and has given us their *rationale*. Few observers, especially in the world of medicine, ever seem to have had any conception that nature furnishes us with the facts, or phenomena alone, and not the *philosophy;* that must be developed in the mind of the observer; the only difficulty in the case being, that the philosophy must be *that* of the facts, and not a philosophy discordant with them. Medicine, no less than pathology, is replete with fallacies, and its professors must learn that philosophy as well as observation, intellectual resources as well as industry, are demanded. Indeed, it is no more true that philosophy is at fault in medicine, than it has been in natural history or mathematics. All the sciences alike receive their gains, not from the mere collator of facts, but from the student of intellectual resources, who comes in the order of investigation and discovery after the other, and applies his time and capacity in using the facts brought by the former.]

APPENDIX.

In the current volume of this journal, p. 155, appears an account, quoted from a foreign journal, of some unutterably absurd, so-called "experiments," proclaimed by their author to be "important observations

confirmatory of his idea, and subversive of those of Virchow," upon the mode of production of cells. I simply call attention to the boundlessly absurd and *fabulous* character of these so-called "experiments," to show to those who would not otherwise consider the subject, or would take for granted the statements in question, what their true character is.

The account relates that "the experiments (?) undertaken in this direction are forty-five in number. They consist of occlusion within the animal organism of blood and artificially pure fibrin, and in one case also of albumen." "The fibrin," he says, "in fourteen to twenty hours' time breaks up into granules which become nuclei, organization always taking place from without inward in the transplanted mass." "Some of the cells (?) grow from a large nucleus, from which loosens out a thin wall, *while others are formed* by one or more nuclei, around which a membrane *gathers.*"

That is to say, this miraculous experimenter places a certain quantity of fibrin within the walls of a wound made in an animal, whereupon he sees the above phenomena. But how did he see what he describes? Not with a microscope, that is certain.

Because the microscope could not be applied to see such changes in progress in the body of an *animal in tissues in situ.* And yet it would be wholly impossible to observe any changes in the minute histological elements described without a microscope, and a high-power one too. It is a misfortune this famous experimenter was not more guarded on this point, and it is still more unfortunate he did not describe how many "granules" made a "nucleus." He observed *two* modes of cell production under *one* set of circumstances. One mode in which a nucleus "loosens out a thin wall," and another, "around which a membrane gathers."!! "Again, he squeezes some *fluid from the wound* (?) two days after the experiment, and finds very large cells, which contain one, two, three, or even seven nuclei." "These nuclei are evidently formed out of blood-globules *included in* (?) *the* cell, a fact of which he is perfectly assured;" and he asserts "that in such a case the blood is converted into connective tissue without formation *of any kind of cells or nuclei.*"

Here is a *third* mode of formation of cells, in which blood-globules are built around, are "included in the cell." What a pity this famous experimenter should have been ignorant of the fact that "connective tissue" *consists* of cells or nuclei in great part, and yet he describes that "blood-globules" built it up without "formation of any kind of cells or nuclei." Seeing, too, that the (plasmatic) cells or nuclei of connective tissue are mutually incited by continuation or extension of their very substance, one with another; and seeing, obviously enough, that without these cells of connective tissue (the formation of which he describes "without any cells or nuclei") no extension of their substance one with another, and hence *none of the distinctive elements of connective tissue* can exist, one

would ask what *kind* of connective tissue it was without "formation of any kind of cells,"—and, therefore, without the histological elements of connective tissue—this famous experimenter originated. It is intensely edifying to learn the character of the "experiments" on which this marvelous genius tells us he "impugns the well-known Berlin doctrine *omnis cellula a cellulâ*, which in an especial manner he revolts from." I can imagine the inward laugh of boundless mirth with which the sardonic expositor of this doctrine will greet these "experiments" "subversive" of his idea.

It is, one must think, a great pity this childish experimenter had not looked into the literature of this Berlin doctrine of cell-growth. He would then have learned that the *wound* he made in transplanting, accounted for all the new real cell-forms he observed. He seems never to have dreamed that the "wound" had anything to do with the matter. See, for example, with what a sublime *naïveté* "he squeezes some fluid from the wound two days after the experiment, and finds very large cells" "which are evidently formed out of blood-globules," quite oblivious of the wound, "and removes and subsequently replaces the carotid of a dog," when "the animal gets well without production of inflammation *or formation of pus.*" Wonderful experimenter!

ANAESTHESIA.

BY J. HARDMAN, MUSCATINE, IOWA.

ANÆSTHESIA is usually defined "a privation of sensation." It may be either general or local, its influence pervading the whole system, or but a part. This definition is a little too general for the dentist's purpose, as it would imply the absence of sensibility without reference to cause. My remarks, therefore, will have reference more exclusively to the insensibility induced by artificial agents introduced either into the general system, or applied to a part.

First, then, we would call attention to the agents used to induce general insensibility, and of these we wish to notice only three, viz.: chloroform, ether, and nitrous oxide or protoxide of nitrogen. The history of these, both as to their chemical discovery and their first application for anæsthesia, I will not attempt in this place, but will take it for granted that the reader, like myself, feels the greater interest in their effects and relative merits.

A very important quality in each of these three agents for the induction of anæsthesia is, that they should be free from all agents of a deleterious character. Dentists are seldom furnished with the means by which to thoroughly test their purity, and it therefore becomes frequently a delicate question of conscience how far we should indulge in the use of

those agents, especially if we have reason to infer constitutional unfitness in our patients.

The apparent physical effects of these three agents are very similar, and it is often remarked by patients who have used each that the sensations have been quite similar. Yet it is evident that ether and chloroform produce this effect in a very different way from nitrous oxide. Leaving the modus operandi, I will state it as my conviction that the effect being similar, a relative state of the system is brought about, only differing in proportion to intensity of agent, relative quantity used, manner of exhibition, and peculiarity of subject.

Chloroform is very prompt, and if inhaled freely, will, in from one to five minutes, produce insensibility, and even, in most cases, unconsciousness. If the patient is healthy, the pulse varies but little from the normal beat—at first a little accelerated and full, but as soon as insensibility becomes somewhat general, it is reduced in volume and frequency. An irregular or intermittent pulse indicates danger, and is cause for alarm.

This agent is in its effects so powerful, subtile, and consequently, in many cases, so dangerous, that the operator in dentistry who makes a general use of it for anæsthesia cannot be regarded as blameless, and is, indeed, morally reckless of the health and lives of his patients. The many cases of fatality that have taken place in the hands of careful and scientific men, and the destitution of any reliable antidote, admonish us to *beware*.

Sul. ether (well washed) is my favorite for the induction of general anæsthesia; and for fear of making the subject tiresome, I will at once refer to my mode of procedure in its exhibition. I ascertain the idiosyncrasies, hereditary transmissions, and present health of the patient by inquiry; examine the pulse, place the ear over the heart (and for this purpose have at hand a good plain stethoscope); ascertain when the last meal was taken, and its quality and quantity; avoiding a recent full meal. I avoid cases where there is much organic disease of the lungs; where any evident organic disease of the heart or brain exists, and, with females, in most cases of gestation, I always have a third person present. I examine the mouth, decide what forceps will be needed, and place them in easy reach; decide upon a particular tooth to commence with; place napkins, water, etc. in reach; put the chair and patient in proper position; advise my patient how to take large and full inspirations; admonish him to breathe fully every time, and to continue so long as he has power; use small glass inhaler with sponge, with aperture for a free supply of air; have the patient hold the nose tightly with the fingers of the left hand; place the inhaler to the mouth at each inspiration, but remove at each expiration; frequently examine the pulse; watch the countenance, and when the hand of the patient

drops from the nose, am generally ready to operate. In this I take no time up with the lancet, but crowd well up the necks and roots of the teeth with the points of the forceps, and extract as rapidly as possible. As soon as done, or if the patient recover sensibility, I bring the head forward recumbent over spittoon, to prevent too much blood passing into the fauces. If desired to remove still more teeth, in a few minutes I repeat the inspiration of ether. When done, I wet the head with cold water, and order a cup of strong coffee, which usually removes the effects of ether in a short time.

If ether is inhaled by full, deep, and free inspirations and expirations, its effect is quickly sedative, pleasant, and sufficiently anæsthetic. Its effects pass off quickly, and the necessary quantity used is small. When administered slowly, little by little, it intoxicates and stimulates highly; requires a large quantity to be taken; promotes unpleasant delirium, and its effects leave the patient tardily.

Protoxide of nitrogen is now the popular general anæsthetic among the dentists of this country. It has been but a few years since its introduction to any extent in the profession, yet many thousands have successfully used it for the annihilation of pain in the dental chair. I have not had much experience with this agent, and will but give my hasty opinion in reference to its comparative merits. Its effects are too transient—much more so than ether; it is more troublesome to make ready, and disagrees with more cases of lung complaints.

A case, to illustrate. Mrs. B., aged 40, sanguino-bilious temperament, having had attacks of hæmoptysis, wished to inhale gas. I discouraged her intentions, but offered her the inhaler, to test the effect, to her own mind, as well as myself, by two inspirations. This produced excessive cough, with a general tightness of the chest, as being bound by a cord—these symptoms continuing for many minutes, patient declaring that gas would suffocate her. Two days after, I gave her ether, without the least hack of a cough, and in twenty minutes after she declared herself all right, and left the office.

The gas she tried was evidently pure; used it direct from the gasometer; had never *been* inspired, and others had taken of the same with pleasant effect. Two or three similar cases have occurred in my charge; and I shall, when using it, feel more need of extra caution than in the use of ether.

Secondly. *Local Anæsthesia.* Of these quite a number have been presented to the profession at various periods, most of them consisting of some combination of powerful narcotics, such as chloroform with tincture of aconite, or chloroform with the tincture of opium, etc. These were recommended to be applied to the gums surrounding the tooth. Also, the influence of galvanism conveyed to the tooth by making the forceps a part of the galvanic circle from a battery. Then, also, came congela-

tion of the tooth and gums by means of freezing mixtures, as a combination of ice and salt, applied by variously constructed devices. Among all these, nothing practicably reliable was established until the *congelation* by means of an atomizing spray, which is of so much anæsthetic power, and so useful, that no dentist of operative practice should be without an instrument. I have had the benefit of one now for nearly a year, and can assure my dental brethren I would hardly know how to do without it.

It is *true* that, for extraction, it will not do for universal use, as where the sudden reduction of the temperature excites or aggravates pain, especially in neuralgic cases. It is also impossible to establish its influence satisfactorily about the molars of the lower jaw; yet a large proportion of cases exist where it can be used with facility, and is so completely anæsthetic that patients feel highly delighted with it—will sit for ten or a dozen extractions, declaring they had no more pain than was usual for one in the ordinary way. But this is not the extent of its use. The obtunding of sensitive dentine can be so completely and readily accomplished, and still leave the tooth and nerve healthy, that here it is invaluable. And by it, in many cases, the exposed nerve can be frozen to insensibility, and at once extracted, making the successful treatment of the tooth much more certain and speedy. Again, in the treatment of alveolar abscesses, it will sustain an enviable reputation. My mode is to congeal by applying spray to the gums opposite to the diseased root, and then quickly, with stiff, narrow chisel, or sharp drill, cut freely to the seat of the disease; cut up and remove the suppurating membrane, and then medicate with escharotics and alteratives. I use the Bigelow instrument, with direct spray. Have tried Richardson's instrument, but without satisfaction. It is evident much improvement in instruments, and in the application of this benumbing agent, can be accomplished, and the field for its usefulness much enlarged.

I have now briefly and imperfectly given my ideas and preferences in regard to anæsthesia in dentistry. I wish to add but a few more thoughts, and these upon the moral justification of the dentist in the use of those powerful *general* agents. Feeling that the history of fatality connected with them, and the evident nature of the modus operandi these agents have upon the nervous centres, create a wide field of vital and moral interest, not only in those who take them, but more emphatically in those who encourage and give them.

The intelligent operator must not shut his eyes to the anatomical structure and the functional nature of animal life. He sees that the brain is the great vital centre, and that this *vital principle* holds sacred influence and connection over every part of the system by a beautifully constructed system of nerves. These nerves all centre, either directly to the *brain* or to its appendages. Nerves supplying sensation and motion to the head and many parts of the body, passing off directly from

the encephalon, while many leave from the medulla oblongata and medulla spinalis, and supply the various organs and muscles of the body and extremities.

For our purpose, we may refer alone to the peculiar nerve power which creates or exerts muscular motion. This is of two kinds—*voluntary* and *involuntary.* The latter of these deserves our especial consideration. The heart, the lungs, and the secreting organs are almost exclusively supplied by this variety of nerve influence ; and the great principal seat of this influence is that part of the base of the brain called the medulla oblongata. From this the nerves emerge that supply the heart, that great engine of *involuntary* muscular action, without whose constant and normal operation life is not sustained for a moment.

If, then, an agent is introduced into the general system that has the power to suspend the operation of the higher bulbs of the brain, and thus cut off *voluntary* action—causing the muscles of the head, neck, body, and limbs to fall flaccid, insensible, and lifeless—I need not ask what can be the condition of the whole system. Suppose the agent exerts its influence upon the base of the brain—the medulla oblongata ! Can any one be so wise and so expert that he may give chloroform to the annihilation of life in that bulb of the cerebrum from which the trifacial nerve originates, and leave unparalyzed the medulla oblongata ? It has been, no doubt, correctly stated by M. Flourens that all the other parts of the brain may be safely suspended of their forces, provided the medulla oblongata be unattacked by the agent. And as long as it retains its energy, and remains free from the anæsthetic agent, it is capable of calling the other bulbs into life and activity through its own force. Hence he calls the medulla oblongata the "*vital tie.*" But may not this *vital tie*, this *golden cord*, be as liable to become paralyzed as any other part ? And if it be, then death is the result. I have no doubt in my own mind that this is the mode of operation in ninety-nine hundredths of the fatal cases from these tremendous agents.

Of the three agents I have above referred to, I consider chloroform the most dangerous, from its known activity, and the many cases of death it has caused. I had the misfortune to be present at the last breath of one of its victims, and I crave not another opportunity. Nitrous oxide is next dangerous, in my estimation, judging from its activity and evident mode of operation. And it presents not a very clean history—no better than that of chloroform at its age ; and we may well look for misfortunes to occur from the reckless use many make of it. I regard ether the most safe of all three, and for support to this conclusion, would mainly refer to the long and almost limitless use made of it, and not a well authenticated case of fatality upon record as yet. I have also, by experiments upon animals, tested the relative powers of chloroform and ether. Have kept cats, dogs, and rats under the influence of ether for hours, and still

they recovered perfectly. But the same animals have in several cases succumbed in two to five minutes under chloroform.

The principal post-mortem features of these cases were exhibited in the head and thorax, the brain being pale, blanched, or quite deficient of blood; while the lungs, the large vessels, and heart were a mass of sanguineous engorgement, I think conclusively showing the utter destruction of that nervous force of involuntary contractile power.

To annihilate pain and the horrors of an operation, when done without an unwarranted recklessness, is beneficent; but as much as the art of mitigating pain has advanced, we are still groping very much in the dark; and let it not be forgotten that the life of a fellow-being is of too much account to slight the moral bearing of this question. I therefore ask the profession to join their efforts to help perfect safe as well as efficient anæsthesia.

SOLDERING.

BY F. K. CROSBY, D.D.S., LYNN, MASS.

Soldering may be considered as the uniting of the surfaces or edges of metals by a fusion either of their own material or of an interposing substance of a greater degree of fusibility. The former method is comparatively limited in its application, and is employed principally in cases where it is necessary that all parts of the piece shall be equally strong; also where the greater liability to oxidization possessed by the alloy of metals constituting the solder would interfere with the functions of the article by giving rise to galvanic or electrical phenomena. The latter process is the more generally employed in the dental laboratory, in the familiar examples of the construction and repair of artificial dentine upon a metallic base.

We may conveniently consider this subject under the two divisions of *hard* and *soft* soldering. Those solders only are denominated hard which fuse at the red heat; these can consequently be employed only in the union of metals which are capable of resisting that temperature. Those solders which melt at low degrees of heat are termed *soft*, and may be used for nearly all the metals. In the dental laboratory, hard solders only should be employed, either in construction or repair of metallic plates. In cases where soft solder has been previously applied, however, we may justify ourselves in resorting to its use. It is next to impossible to remove all the soft alloys in these instances, and an attempt to raise the piece to the heat requisite to fuse hard solder would result in burning directly into the plate.

In the manipulations of the dentist, he seldom has occasion to use hard solders other than those whose principal elements are gold or silver. Common gold solder consists of twelve or fourteen parts of fine

gold, the remaining parts silver and copper in various proportions. Brass wire is frequently incorporated. Brass being composed of copper and zinc, the introduction of the latter metal serves to increase the fusibility of the alloy, but renders it liable to the objection advanced by some, that zinc or spelter solders, as they are sometimes termed, impart a brassy taste to the plate and become brittle after long use. On account of their fusibility, we find the zinc alloys useful in repairing where the character of the original solder is not known. When the heat, in soldering, is continued a little above the melting point, the zinc volatilizes. When it is all consumed, the alloy is consequently left tougher and more in the condition of the metals whose union it is desired to obtain; and here we may speak of a general rule in the application of all solders, that the attachment is in all cases stronger the more the alloy approximates in its character to the metals to be united. This is especially true as regards the properties of hardness and malleability. We find that articles in copper or brass, if soldered with spelter solder, which is nearly as strong as the brass itself, may be subjected to violence with little danger of separation, on account of the nearly equal strength possessed by the parts; on the contrary, had soft solder been employed, a comparatively slight strain would have sufficed to part the joints. In accordance with the above rule, if the gold used for the dental plate is of a fine quality, twenty or twenty-two carats, for instance, the solder employed should be finer than that whose composition has been given. In the continuous gum-work, pure gold, often beaten scraps of foil, constitutes the solder which unites the platina lining to the plate and the pins to the lining. In this instance, however, it should be said, another consideration besides that of strength directs our choice of the pure metal for solder. Under the intense heat required to fuse the silicious material of the body, any baser metals entering into the composition of the solder would have the effect of straining the gum.

Silver solder, like gold, is combined with copper and zinc in varying proportions: one dwt. coin silver to six grs. copper and three grs. zinc makes quite an easy-flowing solder. There are, however, numberless recipes for the preparation of solders, both gold and silver, any one of which answers very well for general purposes.

In the arts, gold, silver, copper, and iron in their unalloyed states are frequently employed as solders. Chemical vessels of platina are united with fine gold. Silver is used as a solder for articles made of the alloy of copper, zinc, and nickel, known as German silver. Copper is occasionally employed in soldering iron, and soft cast-iron, in the form of filings, is similarly used for sheet-iron. It will be observed that in all these examples an effort is made to insure, as nearly as possible, equality in strength between the solders and the articles to be united.

It is a curious fact, but one whose truth has been fully demonstrated, that the smaller the particles of solder are, the more difficulty will be ex-

perienced in fusing them. It seems difficult to account for this, but, as before stated, practice has proved the correctness of the theory.

The ordinary commercial soft solder is an alloy of two parts tin and one part lead, and fuses at 340°. A much greater degree of fusibility can be secured by incorporating bismuth with the lead and tin; for instance, five parts bismuth, three of lead, and two of tin form an alloy which melts at 212°, the boiling point of water; and by the addition of three parts of mercury to an alloy of three parts lead, five tin, and two bismuth, we have resulting a composition which fuses at 122°. These may be useful for certain purposes, as fusible plugs, etc., but from their lack of strength are of no practical utility as solders. A good article of soft solder for dental purposes is composed of two and a half parts coin silver and ten parts pure tin, melted separately, poured together, and well stirred. It is sufficiently fusible to admit of manipulation with a small soldering-iron, and retains its color well.

Fluxes, in soldering, are substances which, being placed upon the line of union between the metals, promote the flow of the solder by combining with and removing the oxides which may be present. The metals in their heated state possess a violent affinity for oxygen, consequently the heat necessary for hard soldering would produce, without a flux, such a degree of oxidization as would prevent the attachment of the solder. Borax is the flux generally used in the laboratory. When the heat is too quickly applied, or when it is necessary during the process of heating to add more borax, it boils up with a foaming or frothy appearance, frequently causing annoyance by displacing the solder. This is caused by the forcible escape of the water of crystallization; to prevent trouble from this source, some are in the habit of first driving off the water by heat and using the borax in the form of powder; or the borax may be fused upon the case before the solder is applied.

With soft solders, sal-ammoniac, muriate or chloride of zinc, and common resin are the fluxes usually employed. Cleanliness of the joints is essential in all cases. In hard soldering, all combustible matters about the parts are consumed by the heat to which the article is raised, leaving only the oxidization to interfere with the progress of the work; with the soldering-iron, we are compelled to resort to filing or scraping for the removal of such substances.

It is unnecessary to consider at length the various methods of applying the heat, or the investments and other apparatus which serve to retain the parts in position. In the dental laboratory we are generally able to confine ourselves to the use of the blowpipe alone, with good results; in the arts, the forge, muffle furnace, and other modes of securing heat are called into requisition. The substitution of asbestos for sand in the ordinary dental investments will be found advantageous. Its fibrous nature serves to prevent shrinkage or cracking, and it possesses the additional recommendation of being a poor conductor of heat.

ROOT FILLING

BY A. HOMER TREGO, PHILADELPHIA, PA.

The Dental Cosmos of August, 1867, contains two interesting articles upon the above important subject, the general views of which I concur in, but I am not convinced upon the main point.

Both authors allude to gold as "the best filling for nerve canals," and virtually condemn everything else; yet tacitly admit the impossibility of *always* making the canal *perfectly impervious* by means of gold.

There can be no doubt of the necessity of removing every particle of decomposed matter from the pulp cavity, and disease and inflammation from the root and surrounding parts, and then to make the cavity *perfectly impervious* to liquor sanguinis, gases, etc. Cavities easy of access *can be* made impervious with gold, but a large proportion of roots thus filled *are not done perfectly*, be the operator whom he may. And, I am sorry to say, a majority of *the so-called* profession *never succeed*, unless by accident.

In the days of *The Dental News Letter*, Hill's stopping was recommended. It was much used and badly abused. I tried it in many different forms—warm, cold, liquid, etc. A favorite plan was to apply it warm: first drenching the canal with the liquid (Hill's stopping dissolved in chloroform), thus—proceed to drench the cavity while the filling is warming (all to be done quickly); take the mass between the thumb and finger, and roll to a cone (or flat) of desired size, and while partially soft place it as far into the canal as possible, and force it to its full extent by means of suitable pluggers. I *know* that I have rendered them perfectly impervious to percolation or imbibation by this means; and have preserved badly diseased teeth for over fifteen years, free from any alveolar difficulty or inflammation of adjacent parts. Whereas, with gold, in similar cases, manipulated in the most skillful manner, inflammation, discoloration, abscesses, etc. frequently ensue. This *is and will be* the case with any operator who depends upon gold under all circumstances.

There may be some objection to Hill's stopping, *chemically;* if so, years have not revealed it to me, and my object in offering this article is to give to the profession the benefit (if such it prove) of my improved plan of filling such roots as I cannot be *sure of perfecting* with gold. The modus operandi is similar to the one before mentioned; having the advantage, however, of being more certain and easier to manipulate. I use *clear chloroform* instead of the liquid spoken of; washing the cavity with a tuft of cotton saturated with it, being sure to leave the canal well moistened, and as quickly as possible insert the cone and gently work it to the desired place.

The chloroform dissolves the surface of the cone, and it *readily adapts itself to the full capacity of the canal.*

I sometimes dip the cone in the chloroform instead of drenching the cavity. Some of the surplus may spread over the main cavity, and may be washed out with chloroform before inserting the gold.

Different operators may work it differently. Some may fail, some abuse it; but, if it is manipulated with any degree of skill, *it will not fail* to attain the great desideratum.

In reference to *creasote*, it certainly cannot be right to leave more than "a smell" of it in the root. Is it not very liable to pass through the foramina and *cauterize* the membrane, etc.? What is to become of the "sloughing," gases, etc., consequent to cauterization, when the canal is closed? Is not the result likely to be periostitis, abscess, and—*failure?*

FRACTURE OF THE INFERIOR MAXILLAE.

BY J. G. ANGELL, D.D.S., NEW ORLEANS, LA.

Case No. 1.—On the 22d of May last, Mr. P. P., aged 37 years, a native of Ireland, of the sanguino-bilious temperament, came into my office, suffering with intense pain in the inferior maxillæ. After careful examination and inquiry, I ascertained that he had been suffering several days with odontalgia, caused by the pulp of the first right inferior molar being exposed; and on the previous day he had applied to a barber to have the offending tooth extracted, who, in so doing, used the key of Garengeot, and broke the distal root below the neck of the tooth, and fractured the jaw through the socket of the mesial root. After setting the jaw, and carefully holding it in position, I took an impression of it in wax, and made a plate of the vulcanite base to fit the teeth and keep the parts steadily and correctly in position, taking care to elevate the plate on both sides from the cuspidati to the dentes sapientiæ, thus leaving an opening (or open space) in front by which he could receive his food; using Dr. Garretson's bandage to keep the jaw firm in its proper place. At the end of sixteen days, I removed the plate and found the bone sufficiently united to dispense with it. Several sequestra exfoliated about the fourth week, after which the patient continued to improve until convalescent. He used a wash of hydrastis Canadensis tinct., and took mercurius viv., 2d trit., internally.

Case No. 2.—B. L. P., aged 26 years, a native of Arkansas, of the sanguine temperament, had his inferior maxillary fractured between the right central and lateral incisor teeth by a "blow" received the 21st of May last. The patient did not apply to me for relief until eight days after the unfortunate occurrence, thinking he was only bruised, and as soon as the inflammation subsided he would be "all right again." The

left or longest half of the maxillæ was depressed about one-half the length of the crown of the lateral incisor.

After reducing the fracture, I took an impression and made a plate of vulcanite base, as in the former case, altering it so the cutting edges of the incisors could be seen when the plate was adjusted on the teeth. This was done in order to have a sure guide when the fracture was correctly set. The dressing and treatment was the same as in the other case (Garretson's bandage, wash of hydrastis, and mercurius viv. administered internally), the patient wearing the plate about three weeks, and was cured after the lapse of several more.

A SUCCESSFUL CASE OF RESTORATION OF A DISLODGED TOOTH.

BY H. L. GILMOUR, D.D.S., CAPE ISLAND, N. J.

On the morning of June 6th, at 10 A.M., a young man named Frank ——, of sanguine temperament, 17 years of age, applied to me, accompanied by his mother, for the purpose of having a left superior central incisor tooth inserted, which had been knocked out on the previous evening, by a blow from a boy of combative proclivities, at a strawberry festival.

The case seemed like a hopeless one—so much so that I did not wish to attend to it, and it was only in consequence of a mother's appeal that I took charge of the case. It might be interesting to know that the tooth laid out all night (fifteen hours) on the grass, and was perhaps kept moist by the dew.

I commenced my operation by breaking up the clot of blood in the alveolar cavity, and syringing it out with slightly warm water. During this time the tooth laid in a glass of tepid water. Before inserting the tooth I lanced the gum freely, posteriorly and anteriorly, up to the superior border of the alveolus.

On introducing the tooth the patient fainted, which circumstance gave me a good opportunity to carry it into position, and I succeeded in ligating it before he recovered. I ordered a dressing of charpie saturated with lead-water and laudanum, to be constantly applied, and perfect rest.

Matters progressed fairly for four weeks, when the young man, who seemed to be a victim to blows, was out sailing, and fell overboard, striking his tooth on the side of the boat. The next morning, rather unexpectedly, my patient visited me, and, on examination, I found the tooth twisted, the labial surface directed toward the mesial angle of the right superior central incisor, and the contiguous soft parts highly inflamed. After rearranging and ligating the tooth, I ordered a continuance of the

lead-water and laudanum application, and placed a gutta-percha guard on the second inferior bicuspid. In a week from the time of this accident suppuration took place around the neck of the tooth, and it became slightly offensive. In connection with the lead-water and laudanum, I now ordered an occasional application of a solution of permanganate of potassa, grs. v, to ℥i of water, as an antiseptic, and stimulated him constitutionally. Ten days afterward suppuration around the neck of the tooth had ceased, and considerable adhesions had formed. In two weeks' time I removed the silk ligatures, as the tooth was carried up slightly past the cutting edge of the right central; in a few days, however, it assumed its natural position. For a space of nearly two weeks I did not see the patient, and when he presented himself there was developed over the root of the restored tooth an abscess, which I lanced deeply, carrying the point of the bistoury downward to the free margin of the gum, for the purpose of draining and giving stronger adhesions around the neck of the tooth. The last time I saw the patient, which was September 20th, the tooth and gum looked healthy, and the former was as firm as any of its neighbors.

I regret that I did not drill into the pulp cavity and remove the contents, filling temporarily before inserting the tooth. Such procedure, however, will be necessary and proper when indicated.

USEFUL ITEMS.

BY F. W. GARKEY, D.D.S., MEMPHIS, TENN.

For years I have had the privilege of improving my professional knowledge by perusing the columns of the Dental Cosmos, and know of no better way to show my gratitude to those who have given me the benefit of their experience than to present, occasionally, such ideas as have been useful to me, and are perhaps not generally known. I will head my articles Useful Items, and will commence on a subject to which my attention has been drawn in the July number of the Dental Cosmos, viz., a new "patent" on detaching rubber teeth from vulcanite base.

To detach teeth from rubber, take a No. 2 enameled saucepan, or any other appropriate small vessel; and over a *slow fire* melt a quantity of pure paraffin, and as soon as it comes to the boiling point dip the tooth or block you wish to detach for ten or fifteen seconds in it, and it will become as soft as you need it, to remove the tooth, by gently pressing a chisel-shaped excavator between the tooth and rubber.

A rubber tooth which may not fit the gums, as intended, or stands too far in or out, can readily be adjusted by dipping it in the paraffin, and giving it a touch in the direction you desire. Hold it then on your cheek, and if you can bear the heat, put the work in the mouth; hold firmly with

one hand the plate, and with thumb and finger press your tooth in the position you desire; hold it firmly for two or three minutes, and, if not entirely accomplished, repeat the procedure as often as you please. Paraffin, at the boiling point, will not *hurt* the rubber or spoil its color, no matter how often you dip it, if the paraffin be pure. Of course, rubber clasps around the teeth can readily be adjusted by the same method.

PROCEEDINGS OF DENTAL SOCIETIES.

PROCEEDINGS OF THE ODONTOGRAPHIC SOCIETY OF PENNSYLVANIA.

BY THOS. C. STELLWAGEN, D.D.S.

A MEETING was held Monday evening, September 9th, 1867, at the Philadelphia Dental College Building.

The President, Wm. P. Head, D.D.S., in the chair.

The minutes of the last meeting were read and adopted.

A communication was read by Prof. Harrison Allen, the present incumbent of the Chair of Anatomy in the Philadelphia Dental College. on "THE JAW OF MOULIN QUIGNON," which elicited a unanimous vote of thanks and a request from the Society that a copy might be furnished for publication, with the proceedings.

Prof. McQuillen was pleased with the evidence of patient and extended research manifested in the paper; and sincerely wished that the members of the dental profession could be induced to devote themselves in that way to special lines of investigation, and then carefully and accurately record the results for the advancement of science.

The subject-matter of the essay, although no reference had been made to the fact by the writer, was one that bears directly upon the most absorbing and hotly contested problems that engaged the attention of men of science at the present day, viz.: THE ANTIQUITY OF MAN, and THE ORIGIN OF SPECIES BY VARIATIONS.*

The conclusions arrived at by Prof. Allen, that the jaw-bone of man, and particularly a fragment, cannot be regarded as a reliable basis for determining different races on account of its mutability (dependent upon a variety of circumstances), must be evident to every one present as eminently logical. The anatomical peculiarities which, from time to time, had been pointed out by anatomists as distinguishing and reliable characteristic traits, proved not unfrequently to be of no value when subjected to a rigid and extended examination. The speaker had found this to be the

* The manner in which these subjects are discussed is happily described in the saying of Professor Agassiz: "Whenever a new and startling fact is brought to light in science, people first say, 'it is not true;' then, that 'it is contrary to religion;' and lastly, 'that everybody knew it before.'"

case in two marked instances. The first was in relation to the assertion of Dr. Hunt, *President of the Anthropological Society of London*, that the possession of quinque-cuspid molars (or with five tubercles) was a characteristic peculiarity of the negro, although sometimes specially presented in other races. A careful examination of the skulls in the Academy of Natural Sciences, and a large number in his own possession, proved the incorrectness of the statement, and demonstrating conclusively the quinque-cuspid molar as the typical form of all races. The second instance was with regard to the observation of Dr. John Neill (quoted by Prof. Smith in the American edition of Carpenter's Physiology, as unquestionable), that the *condyloid processes* of the occipital bone have *two articular facets* in the negroes, and but one facet in other races. In an examination of the collections just referred to, he had found skulls belonging to the races said to have but one articular facet, with two, and a large number of negro skulls with but a single facet; proving conclusively to his mind that this anatomical feature could not be relied upon as a race characteristic.

It was a matter of considerable moment to ascertain to what extent and how the different races of men are affected by the combined influences of the climate, soil, and food, not only so far as their physical powers are concerned, but, in addition, the intellectual and moral attributes. For every observing mind must be impressed with the fact that, single or combined, they do exercise a powerful influence upon the condition of man. One of the most marked evidences of the modifying influences of food was presented by the size and form of the jaws, being large and full in those feeding upon coarse food, and diminutive and not unfrequently misshapen in those who, by indulging in soft food, fail to give the maxillæ sufficient exercise.

Dr. Arrington said his experience as a practitioner of medicine and dentistry for eighteen years in the Southern States, had forced him to the following conclusions:

That the teeth of the negro race are inferior in quality, and, after adult age, are more liable to decay than those of the white race. The teeth of the mulatto mixed bloods (white and black) are more defective after adult age than either the white or black race.

That the jaws of the black race are uniformly more perfectly developed than the white race, and the teeth set more evenly in the jaw; but there was rarely any malformation or defective structure of the dental organism; the mulatto less perfecly developed than the whites, yet freer from extreme deformity. The first set of teeth with negro children are more evenly set in the jaws, less crowded, and suffer less from decay than the whites or mulattoes, and continue better to adult age.

Negro children suffer less from teething than white children. Also, the children of the poorer working classes of the white population in the

country suffer but little compared to children of parents in higher life, proving evidently to his mind that the practice of confining infants to breast-milk as a diet until twelve or eighteen months old (as is often advised by some of the best and most distinguished practitioners of medicine in our country), is contrary to common sense, reasoning, and physiology, and destructive to life. In his judgment, the sooner children commence to masticate food the better it is for their health, comparative freedom from suffering while teething, and the general development of their jaws and teeth.

Dr. Head had found the teeth of negro house-servants generally much worse than those of the field laborers, which he attributed to their more delicate food, which required less mastication.

Dr. Stellwagen considered this a striking example of the utility of scientific discussions and investigations, and at the same time an exhibition of how the wide-spread publicity given to a subject by the publication of the proceedings of learned men, tended to the agitation of the same assisting in the discovery of truth and the overthrow of error. How great should be the care exercised by every one in deducing a conclusion, lest error might be temporarily advanced.

The careful investigations manifested in this paper were no more to be admired than that prudence of the writer, which, after proving the irregularity of the configurations of this bone in the numerous specimens examined, showing that a portion of the jaw in itself was not sufficient to prove the existence of another race of men, prevented him from making any assertion that there could not be such a race; confining himself to the opinion that variations between specimens of the jaw are so numerous that one cannot frame a definition that will apply to all forms of this bone.

The consideration of the cause or causes of these variations was a matter eminently important to the practitioner of dentistry, and frequent call for knowledge on this point would be experienced by one having the care of children's mouths.

He would ask, in as much as the judicious use of the arm of the blacksmith, or the lungs and air-passages of the hound and race-horse tended to the highest development of these functions, would not the difference in the use of the jaws account for many if not all the variations in the shape of this bone?

The experience he had had in the examination of the jaws and teeth of negroes during a residence of some months in the South, together with his daily duties when demonstrator of operative dentistry in the dental college, tended to confirm the opinions of the gentlemen preceding him, as to the generally well-developed jaws of the negroes and poorer classes of whites, in contrast with the contracted jaws and crowded teeth of those enjoying greater abundance of money and the luxuries of wealth. Did it not seem reasonable to infer that the law requiring man to live by the

sweat of his brow, meant even more than was usually understood by it; that he must also use his jaws for mastication, and not live upon such soft food as is made for edentulous babes and aged persons?

There is yet another cause of these deformities met with at the present day; and this, he felt sorry to say, seemed to be due to the unwarranted interference with nature on the part of men *calling themselves* dentists, who, led by an acquisitiveness or ignorance equally reprehensible, often commit butcheries that leave their patients to suffer during a lifetime from the ills arising from contracted maxillæ—entailing the resulting defects in appearance, speech, and health.

The Society then adjourned to meet Monday, October 7th, 1867.

NEW YORK ODONTOLOGICAL SOCIETY.

BY W. C. HORNE, NEW YORK.

The first annual meeting of this Society was held October 8th.

The following gentlemen were chosen officers for the ensuing year:

President, Dr. C. E. Francis; Vice-President, Dr. W. B. Hurd; Recording Secretary, Dr. Thos. Burgh; Corresponding Secretary, Dr. W. C. Horne; Treasurer, Dr. G. U. Perine; Librarian, Dr. W. Carr; Executive Committee, Drs. A. L. Northrup, E. A. Bogue, W. C. Horne.

This Society is incorporated by the State of New York; its objects being to cultivate closer professional relations among its members, to extend their knowledge of the arts and sciences bearing upon dentistry, to maintain a high standard of excellence in dental art, to interest and instruct the public in dental hygiene, and to secure a higher appreciation of the aims of the dental profession.

The plan of the Society includes the design of securing a corps of active correspondents, in different localities, through whom an interchange of views will be maintained on topics of immediate professional interest. Communications will be received by the Corresponding Secretary, and presented at the regular meetings—to be held for the present, at the houses of members, on the second Tuesday of each month. Professional friends from other cities will be welcomed at these meetings, on introduction by some member in good standing. Corresponding members will be promptly notified of the subject to be discussed at the next meeting, in order that they may have opportunity for preparing their communications in good season.

It is designed to preserve the transactions of the Society in permanent form, and the co-operation of the members of the profession is desired to insure an annual publication worthy of American Dentistry. The next regular meeting will be held on the second Tuesday of November, at the residence of Dr. E. A. Bogue, 28 East Twentieth Street, New York. The subject of discussion will be: "The Physiology and Hygiene of Foods in their Relation to the Dental Organism."

MAINE DENTAL SOCIETY.

BY THOMAS FILLEBROWN, LEWISTON, MAINE.

The Maine Dental Society held its second annual meeting in Portland. The following officers were elected: President, Dr. William Randall; Vice-President, Dr. A. K. Gilmore; Recording Secretary, Dr. Thomas Fillebrown; Corresponding Secretary, Dr. I. Snell; Treasurer, Dr. J. B. Fillebrown; Librarian, Dr. S. C. Fernald; Executive Committee, Dr. E. Bacon, Dr. A. K. Gilmore, Dr. C. W. Pierce, Dr. J. Strickland, Dr. G. W. Reed.

Drs. R. L. Merrill, of Foxcroft, E. Y. Wasgatt, H. T. Tefft, and E. C. Young, of Bangor, were elected active members of the Society.

Voted that the next meeting be held in Lewiston, on the third Tuesday in March.

Dr. I. J. Wetherbee, of Boston, occupied the close attention of the Society during the evening, with a lecture on filling approximal cavities in the teeth, filling nerve cavities, and treatment of alveolar inflammation and abscess.

Wednesday Morning.—The Society met at the office of Dr. Evans, and witnessed clinical operations by Drs. Wetherbee and Salmon, after which they assembled again at 10 o'clock and listened to further remarks from Dr. Wetherbee, on Filling, and from Mrs. Wetherbee, on Chemical Affinity.

NORTHERN IOWA DENTAL ASSOCIATION.

BY EDMUND NOYES, DUBUQUE, IOWA.

In compliance with a call issued by Drs. C. Poor, of Dubuque, A. B. Mason, of Waterloo, and J. S. Nicholson, of Anamosa, a number of Dentists met at Dyersville, Iowa, Sept. 17th, for the purpose of organizing a new Dental Association for the northern part of the State.

Dr. Poor was appointed Chairman, and Dr. Mason Secretary. A constitution and by-laws were reported by a committee appointed for that purpose, and were adopted by the Convention.

The Association then proceeded to the election of officers, with the following result: Dr. A. B. Mason, of Waterloo, President; Dr. E. L. Clarke, of Dubuque, Vice-President; Dr. E. Noyes, of Dubuque, Corresponding Secretary; Dr. D. H. Gill, of Independence, Recording Secretary, and Dr. C. Poor, of Dubuque, Treasurer.

Executive Committee: Dr. E. L. Clarke, of Dubuque, Dr. J. T. Abbott, of Manchester, and Dr. C. Poor, of Dubuque. For Committee on Membership: Dr. E. Noyes, of Dubuque, Dr. M. D. Goble, of Dubuque, and Dr. John Nicholson, of Tama City. Committee on Dental Ethics:

Drs. J. H. Bowers, of West Union, D. H. Gill, of Independence, and J. S. Nicholson, of Anamosa.

Adjourned to meet at Cedar Rapids, on the second Tuesday in June, 1868.

SUSQUEHANNA DENTAL ASSOCIATION.

BY M. D. L. DODSON, WILLIAMSPORT, PA.

THE fourth annual meeting of this Association convened at Wilkesbarre, July 17th, 1867.

Dr. H. Gerhart, President, was re-elected for the ensuing year; Vice-President, C. M. Williams; Recording Secretary, M. D. L. Dodson; Corresponding Secretary, C. S. Beck; Treasurer, J. L. Andrews; Librarian, R. E. Burlan; Executive Committee, J. M. Barrett, G. M. Renn, J. D. Wingate.

The President delivered an address.

Dr. Beck announced the death, in March last, of Dr. W. A. Chittenden, of Scranton, a member of the Association. A committee was appointed to draft resolutions suited to the occasion.

Milton was chosen as the place of meeting in January next. Subject for discussion, "The Functions of the Teeth in their Relations to Digestion."

Essayists—J. L. Fordham, R. E. Burlan, E. D. Williams, J. M. Barrett, H. C. Stecker, and J. D. Wingate.

DELAWARE DENTAL ASSOCIATION.

BY S. MARSHALL, WILMINGTON, DEL.

THIS Society met in Dover on the 13th of June last. This being the annual meeting, an election was held for officers, with the following result: President, Dr. Smith, of Salisbury, Md.; Vice-President, Dr. Register, of Milford, Del.; Corresponding and Recording Secretary, Dr. Marshall, of Wilmington; Treasurer, Dr. Jones, of Wilmington; Librarian, Dr. Caulk, of Wilmington.

Essays upon various subjects were read. A committee was appointed to prepare a bill for the regulation of the practice of dentistry in the State, to be presented at our next meeting, preparatory to laying it before the next session of the Legislature.

EDITORIAL.

DELAYED MATTER.

A NUMBER of communications from correspondents and the editor of this department are compelled to lie over until the next number, on account of insufficient room in the present one. This explanation is offered that there may be no misapprehension on the part of our contributors.

J. H. McQ.

BIBLIOGRAPHICAL.

A Dictionary of Medical Terminology, Dental Surgery, and the Collateral Sciences. By Chapin A. Harris, M.D., D.D.S., Prof. of the Principles of Dental Surgery in the Baltimore College, etc. Third edition, carefully revised and enlarged by F. J. S. Gorgas, M.D., D.D.S., Prof. of Dental Surgery in the Baltimore College. Philadelphia: Lindsay & Blakiston. 1867.

The constant mutations taking place in living languages (old words changed in their application or becoming obsolete, and new ones springing into existence to describe the discoveries and advances made in the sciences, arts, and letters) make it absolutely necessary that every few years new and revised editions of standard dictionaries should be published, presenting a faithful portraiture of the language as used at the time by educated minds. To no department of lexicography does this apply with more force than to the compilation of scientific dictionaries, and particularly for a profession like our own, which, figuratively speaking, although but a thing of yesterday, in comparison with other professions, has made such rapid progress that its nomenclature, in a period much less than that allotted to the life of man, has assumed an importance and proportions sufficient not only to demand a dictionary devoted to the elucidation of its technicalities, but a second and a third edition of the same has been required; a copy of the last of which, edited by Prof. Gorgas, has been received from the publishers.

Such a work, to properly meet the needs of the profession, should be a *complete dictionary of medicine* as well as of *dental surgery;* and this was the avowed aim of Prof. Harris, in the preparation of the second edition. This accurate conception of the demands of the case, however, has been more fully realized in the edition under review than in the preceding one; and between two and three thousand new words having been added to it, along with additions and corrections made to the definitions of many others, it has thus become a much more valuable and desirable work of reference for the student and practitioner.

Recognizing that criticism is easy and execution difficult, and appreciating the time and labor which this work has cost the editor, and with no disposition to undervalue his efforts, it is yet a matter of regret that he did not exercise larger discretion in curtailing the essay-like character of the definitions of many of the words relating to dentistry, and thus secure room for an additional number of words in use among dental practitioners, and belonging to other branches of medicine and the collateral sciences, which bear directly or indirectly upon dental science. In illustration of this may be cited two words out of a number whose absence has been observed, and which might have appeared with much propriety, viz., Eb-ur-na-ted (from *ebur*, ivory), a term applied by Mr. Tomes and

other writers to dentine in which the dentinal tubuli have been obliterated by calcareous deposit within their walls. EX-U-VI-A-TION (from *exuo*, to put off), a word frequently employed by physiological writers to denote the shedding of the deciduous teeth. Again, accurate pronunciation of scientific words is a matter of the greatest moment to the professional man, and no dictionary can be regarded as complete in which this important point is unattended to. "What correct spelling is to the writer, correct pronunciation is to the speaker. If either should be wholly neglected, the most perfect language would soon become a perfect babel, and fall into utter corruption." The vast majority of dental practitioners have been denied the advantages of a classical education, and to them the syllabic division of words indicated above would prove of great service in securing accurate pronunciation on their part.

While, as a faithful journalist, directing attention to these matters with the hope that it may have some weight in the preparation of subsequent editions, I feel fully justified in saying, after a careful examination of the work, that it contains a large amount of information indispensable to the dentist, which cannot be found in any other dictionary, and that no one will have occasion to regret purchasing it, but on the contrary find it a valuable addition to the library. The mechanical execution of the work, the paper, typography, binding, etc., has been performed in a manner highly creditable to the publishers, and contrasts very favorably with some of the works issued by other houses. J. H. McQ.

OBITUARY.

A SPECIAL meeting of the Pittsburg Dental Association was held at the office of Dr. J. S. King, Oct. 3d, 1867, to take action in regard to the death of DR. HENRY BAKER.

A committee was appointed, who subsequently reported the following resolutions, which were unanimously adopted:

Resolved, That this Society shows its affection for the virtues of our departed friend and brother, by placing on record these expressions of our bereavement and sorrow for his departed worth.

Resolved, That our sympathies are hereby tendered to the relatives and friends of the deceased, in this sad and inscrutable dispensation of Providence.

Resolved, That a copy of these resolutions be conveyed to the family of the deceased, and these proceedings be published in the dental journals.

JAS. KING, C. L. WUESTENBERG,
J. S. ORR, G. W. SPENCER,
J. GREENAWALT, M. S. KING,
M. E. GILLESPIE, *Committee.*

PERISCOPE OF MEDICAL AND GENERAL SCIENCE IN THEIR RELATIONS TO DENTISTRY.

BY GEO. J. ZIEGLER, M.D.

*On Heat in its Vital Relations.** By Geo. J. Ziegler, M.D.—"Heat is an essential condition of life. The degree of temperature necessary for organic or vital actions varies, however, according to the special character and peculiarities of the organism. Nevertheless, it is in all cases more or less definite and fixed, and in relative proportion to the grade or intensity of vital action, this being either prevented or suspended by a temperature below or above certain points, and hence organization can only take place within specific thermometric limits. Within these limits, in general, a low temperature retards, while a high temperature promotes organic or life action, the vital energy and activity being mainly in proportion to the degree of heat. The relative proportion of heat required will, however, necessarily depend upon the class, type, special character, habits, functions, activity, and other peculiarities of the organism, as well as its more simple or complex nature. In man the degree of heat essential to healthy action ranges from $96\frac{1}{2}°$ to 102°, though it usually approximates 100°, and is somewhat uniform in all climates and seasons. Whenever, therefore, it passes beyond these limits, and either above or below the normal standard, derangements of various kinds and degrees, and even death itself may more or less rapidly ensue. It will thus be seen that heat performs very important functions in the living economy. In man, and the animal organism generally, it promotes the various organic and dynamic functions. These are thus defined by an eminent and philosophic physiologist:† 'Heat subserves two very important purposes in the animal economy: *First.* It is indispensable for the production of various protoplasmata out of the common plasma, and likewise for the evolution of forms; and *secondly,* it develops mechanic power by being converted into the nerve motor-force through the medium of the nerve centres.'‡ It will thus be seen that for the chemical, physical, and organic processes of vegetal life, physical, mechanical, and dynamical purposes of animal life, and probably also to some extent for the higher and more complex functions of psychical life, not only a definite quantity, but a comparatively high degree of heat is required.

"The temperature requisite for the vital purposes is, in man and some other animals, after a certain degree of development, principally generated within the body, though it is also supplied more or less freely from without. Hence there are two great sources of heat for biological purposes, viz., the internal or organic, and the external or extraneous. The principal source of temperature within the body is undoubtedly due to

---

* Considerable interest having been excited in the profession by the recent remarks of Dr. S. S. White on the hygienic influence of sunlight, at his request we reprint two articles on the correlative subjects of heat and light in their vital relations, being part of a series on consumption, published more than eight years ago in the *Med. and Surg. Reporter* of this city. The paper on light will appear in the December number of the Dental Cosmos.—Z.

† Jackson.

‡ Reese's Analysis of Physiology, 2d ed., p. 35.

the chemical changes going on therein, yet it is more than probable that much heat is also evolved by the mechanical processes and dynamical influences, as well as the more purely organic or vital operations of the economy. This idea does not seem extreme in view of the facts that heat is developed out of the body by mechanical and dynamical means, as well as chemical action, and that these are analogous to and correlative with those operative within the living organism. It is also sustained by the fact that physical, nervous, and mental excitement cause an increase, or a more or less rapid development of animal heat, which, though partly, cannot be considered as exclusively dependent upon chemical action. Again, it is still further confirmed in the diminution of temperature by the absence or withdrawal of nervous and psychical influence. The temperature of the animal economy is, therefore, mainly dependent upon various conditions, operative within itself, organic, chemical, mechanical, and dynamical. It may hence be increased or diminished in various ways; thus, by the quantity and character of the food, drink, and air, nervous and mental states, exercise or repose, clothing, exposure, etc. In addition to the internal sources of heat, there are, as before mentioned, others external to the system. The principal of these are the planetary, such as the sun and earth, and chemical action, the most important and useful of which is common combustion.

"The capacity for the internal generation of heat differs in different species, according to their special character, functions, and peculiarities of organization. This capacity for generating heat varies, however, not only thus in different species, but also in different individuals of the same species, and in the same individual, and even in the same organ or part at different periods of time. Thus in man, for instance, there is considerable diversity in this respect. This diversity is generally well marked, and is usually characterized by corresponding peculiarities of constitution indicative of the different grades of vital energy and capacity. Thus, all other things being equal, those who generate heat freely and abundantly, have, in the main, a higher grade of organization, and are correspondingly more predisposed to derangements of an acute, active, and sthenic character; while conversely, those endowed with a moderate capacity for the evolution of heat, are usually less vigorous and healthy, and have a proportionate tendency to affections of an adynamic, atrophic, and chronic nature. This natural capacity for the production of heat is, however, more or less influenced by the age, sex, period of the day and year, variations of external temperature and character of climate, habits and modes of living, degree of exercise, quantity and quality of aliment, air, and drink, nervous, psychical, and other states, morbid conditions, etc.

"The necessity of a due proportion of heat for the perfection of the vital processes, the development of the organism, the preservation of health, and the existence of life itself is therefore manifest. But the method whereby it is furnished is not so apparent, though, as before stated, it is probable that it is principally due to the organic, chemical, mechanical, and dynamical processes of the living economy itself. All other things being equal, then, the quantity and the intensity of this heat is in proportion to the nature and rapidity of the chemical changes and molecular modifications, the mechanical processes and dynamical influences, and the character, functions, and activity of the entire organism. A due amount of heat or a definite temperature is, therefore, a *sine qua non* for, as well as a result of healthy action, either organic, chemical,

mechanical, or dynamical. In a state of health, then, the various processes of life are, in the main, attended with the evolution of sufficient heat for the several special and general purposes of the economy, such as the transformation of alimentary matter, cell action, hæmatosis, assimilation, disintegration, innervation, locomotion, etc. Whenever, however, the process of calorification is not sufficiently active, and the artificial sources for the extraneous supply of heat fail, or the temperature of the body becomes from any cause reduced below the normal standard, more or less disturbance of the economy, or even the total destruction of life itself may take place. The abnormal aberrations may be exhibited in various ways, such as, for instance, in imperfect or depraved formative and retrogressive metamorphoses, deranged cell and molecular action, defective hæmatosis and histogenesis, and irregular secretion, excretion, innervation, intellection, and other abnormities. Derangement of various kinds and degrees, or even death itself may, however, result from an excess as well as a deficiency of heat. These derangements may also be exhibited in all parts of the system, the vegetal, animal, and psychical life inclusive.

"Whenever, therefore, the economy becomes incapable of generating the requisite quantity of heat, or this cannot be sufficiently compensated for by that obtained from extraneous sources, and the temperature of the body is reduced for any length of time below the healthy standard, various forms of derangement, and especially of the nutritive and dynamic processes, are apt to occur. Tuberculosis may be thus engendered, and tuberculous matter developed. It is, however, found that in this affection, the temperature is frequently above rather than below the normal standard. This is not, however, general; and when it does occur, is rather a consequence of diseased than of healthy action; as, in reality, the normal molecular, cell, and chemical actions, which are the principal means for the development of heat in the economy, are in this disease in more or less abeyance—indeed, the inertia or irregularity of these processes are among the active causes of the tuberculous affection. Besides, both clinical observation and personal experience teach that in the main, and *ab initio*, the temperature is rather below than above, or even up to the healthy standard. While, therefore, this modification of temperature is often an antecedent, it is also a consequent of the general morbid condition. In general, then, in tuberculosis the organic temperature is rather below than even up to, and much less frequently above the normal standard, the function of calorification being in greater or less abeyance. Nevertheless, the tuberculous disease is often attended, in the advanced condition especially, with frequent alternations and extreme diurnal variations of temperature, which are more particularly marked between the night and day, though they may occur at any period of the day. These extremes are frequently exhibited in the phenomena of hectic fever, though they may be connected with and even give origin to other forms of derangement. This hectic condition is, however, connected more or less intimately with the nervous system, and it may be that the frequent and extreme modifications of temperature thus exhibited are due in some measure to the depressed condition or abnormal excitement of the dynamic apparatus than to the irregular chemical and molecular action, though it is necessarily more or less connected with the latter. This does not seem unreasonable in view of the influence which the nervous system exerts over the function of calorification and the production of heat.

"Thus, the temperature in phthisis is frequently modified and usually diminished, though, as before intimated, it is very variable and irregular, often alternating from a lower to a higher grade, with a tendency to a gradual and permanent decline, as in other and analogous conditions of starvation or general atrophy. This modification and variability of temperature is thus analogous to that which takes place in actual starvation, and hence by so much strengthens the belief in the general similarity of the two conditions, though the one is a consequence of an insufficiency or absolute privation of aliment, while the other is mainly the result of inability to transform and assimilate it. This analogy between absolute starvation by the privation of food, and that from the inability on the part of the system to appropriate or organize it, which latter is the fundamental condition in phthisis, is made more apparent by the following, which we transcribe in consequence of its practical bearing upon the point in question:

"'Our knowledge of the dependence of all the vital processes in warm-blooded animals upon the heat of their bodies, and of the dependence of their calorifying power upon the due supply of material for the combustive process, has received some remarkable additions from the experiments of M. Chossat upon starvation. He found that birds, when totally deprived of food and drinks, suffered a progressive, though slight, daily diminution of temperature. This diminution was not so much shown by a fall of their maximum heat, as by an increase in the diurnal variation, which he ascertained to occur even in the normal state. The average variation in the *inanitiated* state was about 6° (instead of 1½°), gradually increasing as the animal became weaker; moreover, the gradual rise of temperature, which should have taken place between midnight and noon, was retarded; while the fall subsequently to noon commenced much earlier than in the healthy state; so that the average of the whole day was lowered by about 4½° between the *first* and *penultimate* days of this condition. On the *last* day, the production of heat diminished very rapidly, and the thermometer fell from hour to hour until death supervened; the whole loss on that day being about 25° Fahr., making the total depression about 29½°. This depression appears, from the considerations to be presently stated, to be the *immediate* cause of death. On examining the amount of loss sustained by the different organs of the body, it was found that 93 per cent. of the *fat* had disappeared; being all, in fact, which *could* be removed; while the nervous centres scarcely exhibited any diminution in weight. * * * * Whenever, therefore, the store of combustible matter in the system was exhausted, the inanitiated animals died, by the cooling of their bodies, consequent upon the loss of calorifying power.'*

"Now, as this modification and variability of temperature resulting from starvation is thus shown to be analogous to that in tuberculosis, and the conditions of system appear to be somewhat similar in the two cases, it is highly important, nay absolutely necessary for the preservation of life and restoration of health, that the normal temperature should be restored. Hence the due proportion of heat should be supplied, and be generated, if possible, by the organism itself, though in the event of its incompetency it must be obtained from without. Whenever, therefore, the organic processes and systemic energies become thus deranged, and

---

* Principles of Human Physiology, Carpenter, 5th Am. ed., p. 623.

the animal temperature irregular or diminished, it will be necessary to resort to the most efficient means to restore the vital equilibrium and normal temperature. For this purpose it will be necessary, in the first place, to employ more freely and exclusively those articles of aliment which are most powerful in giving tone to the general system, and which most readily exalt and stimulate the process of calorification. Also, to promote the same by plenty of pure fresh air, suitable clothing, and judicious exercise, as it is better to keep up and restore, if possible, the vital energies and normal temperature by such hygienic means, than to trust too implicitly to extraneous influences. When these are not sufficient, resort may be had to the extraneous sources of artificial heat, the most general and convenient of which, in cold climates, is chemical action as in the ordinary process of combustion. If this does not suffice, it may be necessary to seek that of a planetary nature, by a residence in a warm climate.

"The powerful influence which artificial heat exerts in supporting life when the supply from the natural sources fails, and in promoting the various processes of nutrition, secretion, innervation, muscular action, etc., is strikingly shown by the experiments of M. Chossat. And though the following in relation thereto is somewhat long, yet it is so pertinent to the subject under discussion, and of so much practical value in the present connection, that we prefer to transcribe it in full than attempt a mere general outline. It is proper to state, however, that these remarks are in continuation of the subject just alluded to in the preceding quotation (*supra*).

"'When inanitiated animals, whose death seemed impending (in several instances, death actually took place while the preliminary processes of weighing, the applications of the thermometer, etc. were being performed), were subjected to artificial heat, they were almost uniformly restored from a state of insensibility and want of muscular power to a condition of comparative activity; their temperature rose, their muscular power returned, they flew about the room and took food when it was presented to them; and if the artificial assistance was sufficiently prolonged, and they were not again subjected to the starving process, most of them recovered. If they were left to themselves too early, however, the digestive process was not performed, and they ultimately died. Up to the time when they began to take food, their weight continued to diminish; the secretions being renewed, under the influence of artificial heat, sometimes to a considerable amount. It was not until digestion had actually taken place (which, owing to the weakened functional power, was commonly many hours subsequently to the ingestion of the food), that the animal regained its power of generating heat; so that, if the external source of heat was withdrawn, the body at once cooled; and it was not until the quantity of food actually *digested* was sufficient to support the wants of the body, that its independent power of calorification returned. It is to be remembered that, in such cases, the resources of the body are on the point of being completely exhausted, when the attempt at re-animation is made; consequently, it has nothing whatever to fall back upon; and the leaving it to itself *at any time* until fresh resources have been provided for it, is consequently as certain a cause of death as it would have been in the first instance. It can scarcely be questioned, from the similarity of the phenomena, that inanitiation, with its consequent depression of temperature, is the immediate cause of death

in various diseases of exhaustion; and it seems probable that there are many cases in which the depressing cause is of a temporary nature, and in which a judicious and timely application of artificial heat might prolong life until it has passed off, just as artificial respiration is serviceable in cases of narcotic poisoning.'*

"If, therefore, the application of artificial heat is so powerful in modifying the evil effects consequent upon starvation, it is reasonable to infer that it would also prove very useful in all analogous conditions of depression, whether temporary or prolonged, and clinical experience furnishes much practical evidence in favor of this view. The importance of preserving the proper temperature of the body by artificial means where the natural fails, as in the case of partial or complete privation of food, as well as in all other adynamic and atrophic conditions, tuberculosis included, is thus exhibited in a remarkable manner. Hence, in phthisis every attention should be paid to the judicious supply of artificial heat in conjunction with proper alimentation, aeration, clothing, exercise, and everything else necessary to insure healthful calorification. This hygienic surveillance should be constant both day and night, and in the latter especially, as it is during this period of time that the usual diurnal variation of temperature reaches its minimum, and the thermometric depression is apt to be extended still further in consequence of the adynamic state incidental to the tuberculous disease. Thus it frequently occurs that this more extreme diurnal variation, and greater diminution of temperature during the night, not only increases existing derangements, but develops latent tendencies into active morbid conditions, and also gives rise to fresh complications. Hence the necessity for constant and intelligent care to guard, as far as possible, against all contingencies."—(From the *Medical and Surgical Reporter* of April 30, 1859.)

—

"*Heat as a Means of Resuscitation.*—Dr. Jos. G. Richardson, of Union Springs, Cayuga County, New York, in the *American Journal of the Medical Sciences* for January, 1867, makes some striking remarks on the value of heat as a resuscitating agent. He acknowledges that in the experiments he adduces, he acted upon a suggestion of Dr. B. W. Richardson, of London, who has had remarkable success in restoring the heart's action in animals by injecting warm blood into the coronary arteries. The cases adduced by Dr. Richardson are very striking. One is that of a new-born child in whom all the ordinary methods of stimulating the heart and respiration, including artificial respiration, had well-nigh failed. Dr. Richardson laid its corpse-like body on a bed of flannel *on the hearth of a large cooking stove, heated its arms and legs alternately only a little short of the blistering point, and then by firm centripetal friction drove the hot blood along the desired course.* 'The effect of this treatment was miraculous.' Both respiration and circulation improved wonderfully, and Dr. Richardson thinks that but for the officious administration of food in his absence and against his instructions, the child would have continued to live. His second experiment was on a chicken that had been drowned. He opened the chest, and found the heart beating twenty minutes after the last gasp of respiration; in ten minutes more it ceased to pulsate naturally, though it could be irritated to pulsation. One hour and twenty minutes after respiration had ceased, the heart, remain-

* Carpenter's Prin. of Human Physiology, 5th Am. ed., p 624.

ing *in situ*, was exposed to the heat of a stove. After being submitted to this heat for one minute, the cardiac movements recommenced strongly and regularly, at the rate of about fifty beats per minute. On removal of the body from the heat, the cardiac contraction gradually diminished. Two hours and a quarter after death the heart was slightly moistened, and again heated as before; eighteen pulsations a minute were thus obtained. Twenty minutes later, slower but regular pulsation was obtained by a further application of heat.

"Dr. Richardson quotes, as illustrating his point, two experiments of Dr. Sansom. In one, the action of the exposed part of a kitten was arrested by chloroform vapor. It was instantly restored by directing a jet of steam on the organ. In another, a rabbit was chloroformed to apparent death. After a few inflations of the lungs, the chest was opened, and the heart found beating rhythmically. Warm air was blown into the lungs, and stronger pulsations of the heart followed. In these experiments it is not certain that the element of heat had much to do with the result. The good effects of external warmth in strangulation, drowning, and other states of imperfect respiration, have long been known, and were pointed out, among others, by Sir Benjamin Brodie. Still, Dr. Richardson's experiments and suggestions deserve attention. The essential peculiarity of them is the strong heat—almost roasting—which he practiced, and pressure on the veins so as to drive the warm blood on to the heart. He refers to the treatment of young and feeble lambs by sheep-breeders. One sheep-breeder said to him: 'When everything else fails, I put them close before the stove and give them a good roasting; that often brings them to life again.' Adding afterward: 'It is astonishing what an amount of heat they will bear; and do them good, too' There is, no doubt, a deep philosophy in these remarks of the sheep-breeder; but we must beware of warming children to the same degree as lambs. A little 'roasting' that in the latter case might not be unpleasant, in the former might be awkward."—(*Lancet.*)

On Coagulation of the Blood. A Correction of the Ammonia Theory. By Dr. RICHARDSON, of London.—"Considerable interest was manifested in a communication on this subject to the British Association for the Advancement of Science, for in it the author withdrew his ammonia theory of coagulation. He referred to the facts which had led him to adopt his theory, and now explained why he abandoned it. Some recent experiments which he had made on the influence of heat and cold on albuminous and fibrinous fluids had shown him that the process of coagulation in these fluids is due to a communication of caloric force to them, and to a physical or molecular change, determined by the condition of their constituent water. Thus, all substances which possess the power of holding blood in the fluid condition, through fixed alkalies, various soluble salts, and volatile alkali, in every respect act after the manner of cold. They render latent so much heat, and in the absence of that heat the fibrin remains fluid. In the opposite sense, every substance which combines with water, and produces condensation, with liberation of heat, quickens coagulation. The direct effects of heat and cold illustrate the same truth; and upon these facts turn the differences of coagulation in animals of different temperatures. The author further stated that in the ordinary condition there is a constant process similar to coagulation progressing in the living body in the formation or construction of muscle,

and a steady and persistent interchange of force from these parts, which are solidified by cold and fluidified by heat, to those which are rendered solid by heat."—(*Ibid.*)

Effects of Extreme Cold on Parts of the Nervous System.—In a communication to the British Association for the Advancement of Science, (*Ibid.*), "Dr. B. W. Richardson explained the effects of extreme cold on parts of the nervous system; and minutely described the effects of extreme cold on the trunks of nerves, on the brain as a whole, on parts of the brain, on the cerebellum, on the medulla oblongata, on the spinal cord, on the whole of the brain and spinal cord, and on the spinal cord in animals under the influence of strychnia (tetanus). He maintained, as a demonstration, that all the activity and function of the nervous system could be removed by the simple process of abstracting caloric; and that all the functions and activity are restored on the restoration of caloric. He held that each centre of the nervous system is an independent centre of power. He urged that between these centres there were certain balances always sustained during life. Thus, two centres in the front of the brain govern the movement of the body backward, while the cerebellum governs the forward or propulsive movements of the body. But these centres balance each other so perfectly that, if one be temporarily killed, the other exerts uncontrolled sway, and the animal moves impulsively backward or forward, according to the part which remains in full power."

Electro-Motor Power of Nerves. "*Matteucci's Latest Researches.*—This eminent philosopher has of late studied the secondary electromotor power of nerves. 'It is well known,' he says, 'that bodies highly gifted with polarity cause, only for a few minutes, a deviation of 25 or 30 degrees of the galvanometer. But with the sciatic nerve of a chicken, a rabbit, or a ewe, 90 degrees are obtained; and the deviation lasts several hours to the extent of 25 or 30 degrees. This secondary electro-motor power is, however, greater toward the positive than the negative pole. Humboldt has said that alkalies increase the excitability of the nerves, and that acids diminish it. This peculiarity I have found correct by several experiments; hence we see that the presence of alkalies in the economy promotes the chemical acts of nutrition. Without indulging too much in hypothesis, we may believe that the nervous plexuses covered by an alkaline layer, after electrolysis, are placed in a more favorable condition for muscular contraction and respiration than other plexuses connected with acid solutions.'"—(*Ibid.*)

"*Section of the Nerves for Neuralgia.*—In *Schmidt's Jahrbuch* (1865), Martini sums up the operative surgery on nerves of recent times to the following effect. He refers, in the first place, to Gherini (*Ann. Univ. di Med.*, Ap. 1864, 188, p. 94), on the subject of operations for neuralgia. This author divides neuralgia into two kinds—anomalous, and regular or essential. The former is of local origin, and curable by division of the affected nerve above the seat of the disease; the latter is due to some irritation of an unknown description, and resists all means hitherto put in use. The former description of neuralgia is caused by the formation of a hard painful kernel in the trunk of the nerve, or by cicatrization after a wound, or by a foreign body, or a severe and deep

contusion. Of this form of neuralgia he refers to eight instances—the first of an affection of the infra-orbital nerve of ten years' standing, caused by cold, and cured by section of the nerve in the infra-orbital canal; four cases of neuroma in the leg, all cured by excision; in two the tumors were developed in the substance of the nerves—true neuroma; in the others in their neighborhood—false neuroma. The true neuroma can be distinguished from the false in consequence of its being always painful when touched or pressed in any direction, while the false is only painful when pressed in the direction which causes it to impinge on the nerve. The sixth case was that of a man whose leg had been amputated. The anterior tibial nerve appeared to have been implicated in the scar between the two bones, so that the least touch on this spot of the stump caused a sudden contraction over the whole body, as after an electric shock, and there was also neuralgic pain. These symptoms ceased at once on the subcutaneous division of the nerve. The seventh case was that of neuralgia of the whole limb, with tetanic contraction of the muscles of the face, after amputation of a toe. This was cured by reamputation. The eighth case was incomplete.

"In contrast to these he gives numerous cases of essential or 'regular' neuralgia, in which all kinds of treatment have been found unavailing, viz., three cases of facial neuralgia, recurring after the actual cautery, subcutaneous section of the nerve, and even division of all the parts down to the bone; neuralgia proceeding from a diseased toe, and extending to spasmodic contraction of the joints of the limb, recurring after two amputations and subcutaneous section of the nerve, and causing death by exhaustion; neuralgia in the knee of a young woman, persisting after amputation of the thigh and excision of a portion of the sciatic nerve, but disappearing after amputation of the hip (Mayor of Lausanne), together with somewhat similar cases mentioned by Tyrrell, Bransby Cooper, and Marshall Hall; neuralgia of the hand persisting after amputation, subcutaneous injection of atropia and excision of a portion of the radial nerve; and neuralgia of the sole of the foot, exacerbated to a frightful degree by treatment with the actual cautery. In traumatic tetanus Gherardi has amputated three times with no benefit.

"He dissuades section of the nerves in this 'essential' form of neuralgia, or at least advises that it should be put off till every other means of treatment has been tried, especially electricity. In some observations on this work of Gherardi, by Legouest, at the Société de Chir. de Paris (*Gaz. des Hôp.*, 77, July, 1864), that surgeon observed that a case by Azam (*Journ. de Bord.*, 2 sér., ix. p. 289, Juil, 1864) supports Gherardi's views. The case was one of neuralgia in the stump of a flap amputation of the leg, accompanied with frightful epileptiform seizures. After various other forms of treatment, the peroneal nerve was first resected, and then, as this produced only slight and doubtful benefit, a piece was cut out of the sciatic nerve. This was productive of temporary cure; but the symptoms returned seven months afterward, though in a milder degree, after a fall. M. Legouest believes that when this frightful affection follows amputation it is always when the flap method has been followed, and advises that in such amputations the ends of the nerves should be truncated. At the same debate two cases were brought forward in which Nélaton had operated on nerves—one was for neuroma of the median nerve, in which the tumor was removed, and the nerve, in doing so, was divided, but the ends united with two silver sutures. At the date of the

report the functions of the nerve seemed to be restored, and the pain had ceased. In the other case, a lady had been attacked with zona in the course of the sciatic nerve, accompanied by intolerable pain. No milder measures having proved of any avail, Nélaton took away an inch from the substance of the sciatic nerve, with the effect of producing paralysis of motion and sensation, but no relief to the pain. Richet and Voillemier supported Gherardi's opinion, that in this 'essential' form of neuralgia section of the nerve is useless. Some account of the discussion which followed at the society may be found either in *Schmidt's Jahrb.* or in the *Gaz. des Hôp.*"—(*Bien. Retrosp.* 1867.—*Amer. Journ. Med. Sci.*)

"*Resections.*—M. Sedillot has written a letter to the Imperial Society of Surgery, on the regeneration of bone. It is too long for quotation entire, but of great interest. He contrasts the two principles of sub-periosteal resection in the following terms:

"'One, to which Larghi has given the general name of sub-periosteal resection, is founded on the idea, that the periosteum detached and isolated in the condition of a sheath or a flap is able to renew or reproduce the subjacent bone from which it is stripped or raised.

"'The other principle, which I have called sub-periosteal gouging or scraping, has for its principle, that it is the periosteum, *only when attached* to the bone, that is able to renew it; and that, in consequence, the bone beneath the periosteum should be husbanded and preserved with the very greatest care.

"'After invoking the aid of the Baconian method of research, M. Sedillot quotes numerous series of experiments which, in his opinion, are sufficient to prove that the periosteal flaps, if completely isolated from the subjacent bone, are unable to reproduce it; "and that the so-called method of sub-periosteal resection is founded on a deplorable illusion;" and gives his opinion that the chief use of preserving the periosteum at all, is to supply a mould for the bony matter which is left in his method of periosteal gouging, and which really reproduces the bone.'"—(*Ed. Med. Jour., from Gazette des Hôpitaux.—Ibid.*)

"*Power of Absorption of Wounds and Abscesses.*—M. Demarquay has submitted to the Academy of Medicine of Paris a series of experiments on this subject. He placed upon wounds and into accidental cavities aqueous solutions of iodide of potassium of the strength of 10 per cent. After from six to thirty minutes, iodine was found in the urine, and especially in the saliva. The author considers that ulcers and abscesses absorb also noxious gases both from the atmosphere and those formed by the decomposition of blood and pus. He therefore advocates the protection of wounds and abscesses from the surrounding air, dressing them with glycerin, alcohol, or disinfectants; and surrounding patients with as pure an atmosphere as possible."—(*Lancet.*)

"*Fatal Hæmorrhage from the Gums after Scarification.*—Dr. James Young communicated to the Edinburgh Obstetrical Society the two following cases of fatal hæmorrhage after scarification of the gums, which occurred in his father's practice:

"'Case 1.—A child, aged 20 months, presented no evidence of disease in any respect beyond the ordinary irritation from teething. The teeth already cut had each produced some disturbance, but without requiring

scarification. With the first eye-tooth, some febrile symptoms were manifested. My father was sent for, and without the least hesitation he advised scarification of the gum, which was forthwith done. A sudden and rather profuse welling of florid blood immediately appeared, and not at once ceasing, as is usually the case, pressure with thumb and forefinger was applied. The hæmorrhage seemed to be allayed, but on withdrawal of the finger, it continued to ooze up and filled the mouth. Nitrate of silver was applied steadily, and pressure again, and yet the blood continued to flow. My father became somewhat anxious, and sent for me. We applied lint, moistened in a solution of the perchloride of iron and glycerin, with as much pressure as possible, and yet the hæmorrhage continued. The last alternative was the hot wire, which was applied the same evening, after Sir James Simpson had seen the case. Next morning, although pressure had been kept up more or less during all the night, and the child fed on beef-tea and wine, with use of iron internally, the hæmorrhage continued. After twenty-four hours' incessant oozing, the child became pale and exsanguine, and yet, extraordinary to say, the child lived for three or four days. Nothing had the least effect in checking the flow of blood, except the pressure, and only so during its application. There was no hæmorrhagic diathesis; the child had never lost blood before, was perfectly healthy, and of healthy parents. The blood was florid. The question here arises, how deep should the scarificator be pressed into the gum, or should the gums be scarified at all, until the teeth are shining through? Scarification may be necessary when the tooth is not close at hand, and the same tooth may require to be cut repeatedly. I have known a case of this kind where the child was attacked with convulsions, which ceased from the incision of the gum; the wound healed up, and the convulsions returned not less than six times from the same tooth, and ceased every time after cutting the gums. Then, again, suppose the scarification be placed deeply in the gum, is it possible that the small offsets or minute twigs of the dental or alveolar branches of the internal maxillary artery could bleed to such an alarming extent without some other cause? What that was, I leave my seniors to divine.

"'The second case occurred at Holyrood; the only difference between that in this case it was the first molar tooth of the upper jaw, while in the first case it was one of the eye-teeth of the lower jaw. The child here was about eighteen months old, and had neither in itself nor mother presented any symptom of a hæmorrhagic tendency. The same result followed the scarification, the same treatment was pursued, and, I regret to say, it had the same painful issue. The child survived one week.

"'Sir James Simpson thought such cases very uncommon. Mr. Robertson, he said, had been in the habit of using an instrument to produce steady pressure on the gum in cases of hæmorrhage. In cases of umbilical hæmorrhage, Dr. Churchill had proposed the use of sulphate-of-lime powder He spoke of a case of umbilical hæmorrhage he had seen with Dr. Moir—a child—where the umbilicus was transfixed with needle and suture. The hæmorrhage ceased for awhile, but returned. The perchloride of iron was applied, and the child recovered.'"—(*Ed. Med. Jour.* and *Amer. Jour. Med. Sci.*)

Congenital Hypertrophy of Tongue.—"Dr. A. Bolter, of Ovid, describes in the Trans. of the Med. Soc. of New York, a case of congenital

hypertrophy of the tongue in a female; causing in her third year the organ to protrude considerably beyond the lips, producing much inconvenience and distress to the patient, and no little deformity. A portion of the tongue, one inch and five-eighths in length, one inch in vertical thickness, and five inches and five-eighths in circumference, was removed by the knife. The recovery of the child was very rapid, and the improvement in her appearance striking."—(*Am. Jour. of Med. Sci.*)

"*Cause of Osteomalacia.*—The cause of the softening of the bones in this disease is explained in a treatise just published by M. Drivon. The results of several analyses prove that in this affection lactic acid and lactates are largely present in the bones. These substances occasion the solution of the phosphates and carbonates, and the pathologic consequences characteristic of the disease naturally follow."—(*Med. Gazette.*)

Illuminating the Interior of the Living Body.—"The exhibition of a cat and dog illuminated *à giorno* agreeably terminated the proceedings of the evening at one of the meetings of the International Medical Congress. These animals were presented by M. Milliot, of Kew, who has conceived the idea of a new means of pathological investigation founded on the transparency of the splanchnic cavities. The author has been led to this invention by the stomatoscope of Professor Foussagrives, of Montpellier, which consists in introducing electric light into the interior of the mouth so as to facilitate the examination of this part. The apparatus consists in glass tubes of different sizes containing a twisted wire made of platina, and which communicate with an electric machine of Middeldorf. The tubes are introduced through the anus for the investigation of the abdominal viscera, and through the œsophagus for the investigation of the stomach. M. Milliot hopes that when this apparatus shall have attained a greater perfection, it may be possible at some future period to apply it to man, and thus arrive at a new means of diagnosticating visceral tumors and other morbid alterations of the stomach, the intestines, the bladder, etc. In the female, for instance, these tubes might be introduced into the vagina and the anus at the same time, and thus serve as a means of making out with greater certainty the different tumors of the ovaries—an important point in practice on account of the frequency of operations on those organs. The author hopes to render the whole human body transparent *intus et extra.*"—(*Lancet.*)

Microscopical Examination of Snails' Tongues.—In reply to an inquiry on the subject, E. S Morse gives, in the *Amer. Naturalist*, the following "information regarding the preparation of snails' tongues for microscopical objects. They are generally mounted in Canada balsam, using a thin piece of glass as a cover to the preparation.

"To dissect the membrane from the mouth, one must use needles for the very small snails, and fine knives for the larger species. One can cut with certainty on such snails as *Helix albolabris*, by slitting the œsophagus open from above, care being taken not to cut the jaw, which can be plainly seen with the naked eye. The incision is made between the larger tentacles. The membrane bearing the minute teeth is quite tough, and can be picked away with needles. For the minute snails the readiest way is to pick the head in small pieces on a glass slide. With the micro-

scope, the portion containing the tongue can be readily detected by the tessellated appearance of that organ. All other fragments are then wiped from the slide, and the membrane can be separated by gently pulling apart the fragment into numerous pieces, and again examining with the glass, removing as before all the bits of muscular fibre not connected with the tongue. With considerable care and patience the tongue may be removed entire. During this work the preparation must be well moistened; a drop of water is sufficient."

—

"*Effects of Alcohol on the System.*—DR. N. S. DAVIS (*Chicago Medical Examiner*, Sept. 1867) having instituted a series of sphygmographic observations of the effects of alcohol on the circulation, thus sums up the results:

"First. Its presence in the blood directly interferes with the normal play of vital affinities and cell-action in such a manner as to diminish the rapidity of nutrition and disintegration, and consequently to diminish the dependent functions of elimination, calorification, and innervation; thereby making alcohol a positive organic sedative, instead of a diffusible stimulant, as is popularly supposed both in and out of the profession.

"Second. That the alcohol itself acts in the system exclusively as a foreign substance incapable of assimilation or decomposition by the vital functions, and is ultimately excreted or eliminated without chemical change.

"The important bearing of these conclusions on the therapeutic and hygienic uses of alcoholic drinks must be obvious to all, and especially demand the careful attention of every member of our profession."—(*Med. and Surg. Reporter.*)

—

Antidote to the Poison of Chlorine Vapor.—"PROFESSOR MAISCH says that a direct antidote to the poisonous effects of the inhalation of chlorine is sulphuretted hydrogen, the halogen combining instantly with the hydrogen, liberating sulphur. The professor has tried it himself after accidentally inhaling chlorine, and obtained immediate relief. The same remedy would doubtless be effectual in cases of bromine poisoning."—(*Ibid.*)

—

Preservation of Anatomical Specimens. — F MOIGNO gives in the *Chem. News* the following process of M. VON VETTER for this purpose: "Add to 7 parts of glycerin at 22° 1 part of raw brown sugar and half a part of nitre, till a slight deposit is formed at the bottom of the vessel. The portion required to be preserved is then plunged, dried or not dried, and it is left in the mixture for a time proportional to its dimensions; a hand, for example, should remain eight days in the liquid; when it is taken out it is as stiff as a piece of wood, but if it be suspended in a dry and warm place the muscles and articulation recover their suppleness."

—

"*Anatomical Research by a New Method.*—PROFESSOR BRAUNE, of the University, Leipsic, has just published a method of making accurate drawings of the human system, which is at once novel and startling. He first freezes the subject to a metallic hardness by exposing it to a temperature many degrees below zero for a sufficient period of time, then with a fine saw he severs the frozen body in any direction as may be desired. If proper saws are used, these cuts will be perfectly clean and smooth;

over these cuts a stream of water is poured, which instantly freezes, as the whole operation is carried on in a room at a low temperature, and the ice forms a sort of transparent coating to the severed surface, revealing very distinctly every part and outline."—(*Chem. News.*)

—

Anatomical Specimens Prepared by a New Process.—"Dr. Brunetti, of Padua, who received a gold medal at the Paris Exposition, has generously communicated to the International Medical Congress the following particulars of his valuable invention. The process comprises four several operations, viz.: 1, the washing of the piece to be preserved; 2, the *dégraissage*, or eating away of the fatty matter; 3, the tanning; and 4, the desiccation.

"1. To wash the piece, M. Brunetti passes a current of pure water through the blood-vessels and the various excretory canals, and then he washes the water out by a current of alcohol.

"2. For destroying the fat, he follows the alcohol with ether, which he pushes, of course, through the same blood-vessels and excretory ducts; this part of the operation lasts some hours. The ether penetrates the interstices of the flesh, and dissolves all the fat. The piece, at this point of the process, may be preserved any length of time desired, plunging in ether before proceeding to the final operations.

"3. For the tanning process, M. Brunetti dissolves tannin in boiling distilled water, and then, after washing the ether out of the vessels with distilled water, he throws this solution in.

"4. For the drying process, Dr. Brunetti places the pieces in a vase with a double bottom filled with boiling water, and he fills the places of the preceding liquids with warm, dry air. By the aid of a reservoir, in which air is compressed to about two atmospheres, and which communicates by a stop-cock and a system of tubes, first to a vase containing chloride of calcium, then with another heated, then with the vessels and excretory ducts of the anatomical piece in course of preparation, he establishes a gaseous current which expels in a very little time all the fluids. The operation is now finished.

"The piece remains supple, light, preserves it size, its normal relations, its solid elements, for there are no longer any fluids in it. It may be handled without fear, and will last indefinitely. The discovery is a magnificent one, and the sooner medical schools are supplied with full cabinets of natural and pathological pieces the better."—(*Med. and Surg. Reporter.*)

—

"*Temperature required for forming Fusible Combinations, and for Melting the same.*—C. Schinz finds, by application of a thermo-electric pyrometer, that silicates are formed and melted at the same temperature, and that the formation of the silicates depends more on time than on temperature, *i.e.* it depends in fact on the conducting power of heat, which the materials composing the silicates possess. He also finds the temperature required for melting metals and metallurgical products to be lower, as formerly has been stated by Plattner. The latter states that a temperature of 1789°–1876° C. was required for forming silicates of iron, and of 1431°–1445° for melting the same. Schinz now finds that a temperature of 1000°–1156° C. is sufficient for both purposes. He also finds that a temperature of a glass-furnace in operation is only 1100°–1250°; that crystal glass is worked at 833°, and becomes completely liquid at 929°. A Bohemian green glass tube softens at 769°, and becomes liquid at

1052°. Pure limestone loses its carbonic acid by heating for several hours at a temperature of 617°–675° C. An increase of the temperature will shorten the time."—(*Dingl. F.* and *Chem. News.*)

"*Points of Fusion and Solidification of some Alloys.*—By M. DULLO.

COMPOSITION OF ALLOYS.

Lead.	Tin.	Bismuth.	Point of Fusion.	Point of Solidification.
120 parts.	140 parts.	120 parts.	130° C.	112° C.
145 "	145 "	100 "	140	129
150 "	150 "	75 "	150	135
150 "	150 "	50 "	160	150
170 "	180 "	35 "	170	163
210 "	190 "	30 "	180	165
140 "	155 "	30 "	190	180
200 "	185 "	30 "	200	180
200 "	180 "	30 "	210	180
240 "	150 "	30 "	220	180
207 "	194 "	30 "	180	180

"It is generally to be remarked that the fusion point of an alloy is not in relation to the proportions of the metals which enter into its composition. The alloy of 150 parts of lead, 150 parts of tin, and 50 parts of bismuth (proportions evidently corresponding to 6 atoms of lead, 12 atoms of tin, and 1 atom of bismuth), is one of those which solidify most regularly—that is to say, that no one of the metals entering into its composition crystallizes separately on cooling, and that the alloy remains perfectly homogeneous.

"It may be observed that the point of solidification of the last five alloys on this table is constant at 180°. When these alloys are melted and then allowed to cool, small crystals form at 220°, 210°, 200°, or 190°, according to their composition, and when the temperature has descended to 180°, the whole mass solidifies. It is noticeable that during the whole time of solidification the temperature remains at 180°, and that the mercury of the thermometer again begins to descend only when every part of the alloy has become solid.

"Another alloy remaining very homogeneous, and unvarying in temperature during solidification, is that composed of 207 parts of lead and 294 parts of tin (2 equivalents lead to 5 equivalents tin). This alloy melts at 180°, and solidifies at precisely the same temperature.

"In these two alloys, which have the most useful properties, the different metals are united in atomic proportions, which seems to prove that, to obtain a good alloy, it is necessary to take into consideration the atomic weight of the metals composing it. It is beyond a doubt that such alloys, remaining so homogeneous during solidification, are possessed of valuable properties not belonging to other and less homogeneous alloys. This question is certainly of great interest in the manufacture of printing type, and for similar purposes, and deserves to be thoroughly studied."—(*Bulletin de la Société Chimique* and *Drug. Circ.*)

Platinizing Metals.—E. BEAZLEY recommends, in the *Chem. News*, "the following process, given by PROFESSOR CHURCH, in the *Intellectual Observer*, some time back: 'Dissolve in one ounce of distilled water sixty grains of bichloride of platinum and sixty grains of pure honey. Add to the above solution three-quarters of an ounce of spirits of wine, and

one-quarter of an ounce of ether. The mixed liquids, if not quite clear, must be filtered through a piece of white blotting-paper. The objects to be platinized, which may be of iron, steel, copper, bronze, or brass, are to be thoroughly cleansed by washing them in soda, then in water. When they have been dried, they require heating over a lamp to a heat below redness. For this purpose they may be suspended, by means of a fine wire, over a spirit or an oil-lamp in such a way as not to touch the flame. Suddenly, before they have had time to cool, the objects are to be completely plunged beneath the surface of the platinizing liquid. One immersion for a single minute generally suffices; but the process may be repeated if necessary, care being taken to wash and dry the pieces operated upon before reheating them. The composition of the solution may vary considerably, and yet good results be obtained. Sometimes the addition of more honey improves it; sometimes the proportion of bichloride of platinum may be increased or diminished with advantage. Indeed, it will be found that the appearance of the platinum film deposited upon the objects may be altered by changing the proportion of the bichloride present. The solution may be used several times; gradually, however, it loses all its platinum, the place of this element being taken by the iron or copper dissolved off the immersed objects.' I have tried the plan and found it very successful. I am very happy to contribute my mite toward a column which has frequently given me more information than any other in your valuable journal."

BIBLIOGRAPHICAL.

The Tree of Life, or Human Degeneracy; Its Nature and Remedy, as based on the Elevating Principle of Orthopathy. In two parts. By Isaac Jennings, M.D. New York: Miller, Wood & Co., 15 Laight Street. 1867.

This is a semi-popular theologico-medical work, written in an earnest and conscientious spirit, by one of the Oberlin reformers, who evidently seeks the good of his race.

Assuming the existence, he treats in the first part, of the spiritual degeneracy of man, and attributes it to an extraneous or Satanic power—an idea which is fast becoming obsolete as both irrational and sacrilegious. Such views becloud the mind, embitter life, and belong to the dark ages of religious thought.

In the second, on man's physical degeneracy, he presents some ideas of interest on physiology, pathology, and hygiene; but discards therapeutics as a nullity, trusting to nature for the cure of disease, the entity of which is justly denied, and objects *in toto* to stimulants and drugs of all kinds, in both health and disease. This so-called "Orthopathy," therefore, resolves itself into no practice at all, as its author considers "medicine a gross delusion."

With much that is objectionable and one-sided, the general tenor of this book, however, is to excite thought on subjects of fundamental importance to the welfare of the human race.

The Medical Gazette. A Weekly Review of Practical Medicine, Surgery, and Obstetrics. Edited by Leroy Milton Yale, M.D. $2.00 per annum, in advance. A. Simpson & Co , 60 Duane St., New York.

This new hebdomadal is designed to meet the needs of those who desire to keep *au courant* with the progress of the practical branches and the medical news of the day. It is issued in good style, with large print; contains much useful matter, and commends itself to the profession.

THE

DENTAL COSMOS.

NEW SERIES.

Vol. IX. PHILADELPHIA, DECEMBER, 1867. No. 5.

ORIGINAL COMMUNICATIONS.

ARE THE DENTINAL FIBRILS TRUE NERVE FIBRES?

An oral communication to the Odontographic Society of Pennsylvania, Oct. 7, 1867.

BY J. H. M'QUILLEN. M.D., D.D.S.,
PROFESSOR OF INSTITUTES OF MEDICINE IN PHILADELPHIA DENTAL COLLEGE.

Mr. President and Gentlemen:—I propose to occupy your attention for a short time this evening in the consideration of the true character of the dentinal fibrils, a subject which, as you know, is a somewhat mooted point with the profession.

Involving, as this subject does, careful and extended microscopical examination, it may be advisable to consider some of the difficulties which environ such investigations. As you are well aware, the greatest possible difference exists between individuals in the observation of the ordinary objects which surround us and lie freely exposed to the naked eye, the same things frequently being regarded by different persons as the most opposite imaginable. The media through which objects are viewed, variations of light and shade, distance, etc., tend of course to confuse the mind and lead to erroneous conclusions, unless corrected by the experience arising from extended observation. As an illustration of the fact that variation in the distance at which an object is viewed has much to do with the appearance presented to the eye, last winter, in company with a number of scientific gentlemen, I was looking at some large micro-photographs prepared by Dr. Curtis, of the Army Medical Museum, Washington, D. C., and among them was one of a *diatome*, the *pleurosigma angulatum*, which when held within focal distance of the eye, the *sigma* or spaces appeared hexagonal, but if carried beyond that, they assumed a circular form. Turning to the host, Prof. Frazier, I remarked, "What an admirable illustration this is of the fact that we cannot always believe what we see." In response, he laughingly said, "I

have no confidence in the *visible*, it is the *invisible* alone that I have faith in." If the unaided eye can be so readily led astray, it must be apparent to you how important it is that microscopical investigations should be conducted with the most perfect instruments, and that their employment not only demands eyes to see, but brains to understand the difference between things. An imperfect instrument, or an improper employment of the best constructed one, will lead of course to the most erroneous conclusions. The slightest variation in the adjustment of an instrument makes the greatest possible difference in the appearance of the specimen under examination; lengthened use and extended experience will serve to correct such errors of manipulation. When employing the highest powers, the liability of such fallacious results is of course largely increased, and on this account many observers prefer to depend upon the low powers, and, indeed, some of the most important discoveries made by the microscope have been with a low magnifying power. The value of the high powers, however, cannot be denied; and the investigations of Dr. Lionel Beale with respect to the distribution of the finest nucleated nerve fibres to the elementary muscular fibres of the mylo-hyoid muscle of the little green tree-frog (hyla arborea), proves this in the most satisfactory manner.

Again, it must be remembered that minds are very differently constituted, not only so far as the faculty of observation is concerned, but in drawing conclusions therefrom; in other words, a man may be a very excellent observer whose powers of reflection are not equal to those of perception. Indeed, it is only in rare instances that we find the two combined in the highest degree; frequently those who possess reflective powers of a high order depend mainly upon the varied observations of others, and thus being enabled to take in an extended field of investigation, not only correct the erroneous conclusions arrived at by the mere observer, but in addition discover and enunciate great laws. Newton, with his high culture, the rich results of the accumulated observations of the past, combined with his own laborious investigations, seeing an apple fall to the ground, drew from that the inference which led him to recognize and enunciate the great law of gravitation.

In addition to the requirements already referred to on the part of the microscopist, it is a matter of the greatest moment that he should engage in his investigation with a free, liberal, catholic spirit, seeking truth alone, and ready to abandon the most cherished opinions when satisfied that they are untenable, and regarding those who correct his errors in the light of friends.

With these prefatory remarks let us enter upon the subject-matter of the evening. You are well aware that three theories have been advanced to account for the exquisite sensitiveness frequently manifested by the teeth when operating upon them. The first of these attributes it to the

presence of nerve fibres in the dentinal tubuli; the second, to pressure upon the liquor sanguinis in the tubes being conducted to the sensitive pulp; the third, to the vibrations of the molecular structure of the dentine excited by the contact of the instrument and conveyed molecule by molecule to the sensitive pulp. These hypotheses were entertained for years prior to the discovery of what are known as the dentinal fibrils. As science may be truly regarded as the highest type of growing knowledge, it may be well to see what investigations were made which led to the recognition of these fibres. I believe Prof. Owen is entitled to the credit of first observing what are called dentinal fibrils, as will be found by the following extract from his work:* "I had the tusk and pulp of the great elephant at the Zoological Gardens longitudinally divided soon after the death of that animal, in the summer of 1847. Although the pulp could be easily detached from the inner surface of the pulp cavity, it was not without a certain resistance; and when the edges of the coadapted pulp and tooth were examined by a strong lens, the filamentary processes from the outer surface of the pulp could be seen stretching as they were withdrawn from the dentinal tubes before they broke. They are so minute that to the naked eye the detached surface of the pulp seems to be entire, and Cuvier was thus deceived in concluding that there was no organic connection between the pulp and the ivory."

Subsequent to this, Mr. Tomes discovered the dentinal fibrils in the human teeth, which he describes in the following manner:†

"With proper care in manipulating, nothing is more easy than to demonstrate the existence of the dentinal fibrils in any tooth which has been recently extracted. If a thin section be made in a plane parallel with the direction of the tubes, and then placed in dilute hydrochloric acid until the whole, or a greater part of the lime is removed, and the section be afterward torn in a direction transverse to that of the tubes, many of the fibrils will be seen projecting from the torn edges. It is desirable, in repeating the experiment, to place the decalcified section upon a slide before tearing, as in moving it from the surface upon which it has been torn, some of the longer fibrils may be folded back upon the body of the specimen, and thus become obscured from view. Where the separation between the torn surfaces has been but slight, we may often see a fibril unbroken, stretching across the interval which separates the orifices of the tube to which it belongs.

"If a section be taken in which the tubes are extended into the enamel, and submitted to the action of acid, it will be found that after the latter tissue has been dissolved, fibrils will remain connected with the dentine at those points where the tubes penetrated the superjacent structure.

---

* The Skeleton and Teeth, by Prof. R. Owen, F.R.S., p. 277.

† Tomes' Dental Surgery, American edition, p. 327.

"It is not necessary, however, to decalcify dentine in order to show the fibrils. If a similar section to that already described be divided with the edge of a knife, many of these delicate organs will be seen, but they are usually broken off much shorter, many of them scarcely projecting beyond the orifices of the tubes. Again, if a minute portion of dentine be cut with a sharp knife from the surface produced by fracturing a perfectly fresh tooth, the same appearances will be seen, but not with the same certainty and distinctness as in the previous examples

"In order to demonstrate the connection of the fibrils with the pulp, fine sections should be made with a sharp knife from the edge of the pulp cavity. In this manner I obtained the specimen from which Mr. De Morgan has been kind enough to draw the accompanying illustration, showing the fibrils stretching from the pulp to the displaced dentine, and some of them passing out on the other side of the fragment. That the fibrils proceed from the pulp may be seen by carefully fracturing a fresh tooth with as little displacement of the fractured parts as possible; and then, by slowly removing the pulp from its place in the tooth, we shall be enabled to examine the fibrils which have been drawn out from the tubes. By this procedure some of the fibrils will be withdrawn from their normal position in the dentine in the greater part of their length, a few of them retaining short lengths of their branches, but sufficiently long to show that they have come from the branches of the dentinal tube.

* * * * * * *

"That the dentine owes its sensation to the presence of the dentinal fibrils cannot, I think, be readily doubted, seeing that if their connection with the pulp be cut off by the destruction of the latter, all sensation is at once lost. *It is by no means necessary to assume that the dentinal fibrils are actual nerves before allowing them the power of communicating sensation. Many animals are endowed with sensation, which yet possess no demonstrable nervous system; and we may find many points in the human body highly sensitive, without our being able to demonstrate the presence of nerves in such numbers as would account for the pain uniformly experienced from the puncture of a needle, upon the supposition that the needle had in each case wounded a nerve.* Additional evidence in favor of the view that the fibrils possess sensation may be obtained by examining their condition in diseased teeth, in connection with the phenomena manifested by the disease. In those cases in which the fibrils are consolidated in the manner which will be hereafter described, there is perfect absence of pain when the affected part is cut into; but so soon as the instrument reaches the healthy dentine, more or less inconvenience is felt. If, on the other hand, there is no consolidation of the fibrils, but the pulp is yet living, the operation of removing the carious part is productive of pain, even from the commencement; indeed, pressure upon the surface of the softened tissue gives rise to dis-

comfort. If in such cases the softened dentine be examined, fibrils may here and there be found but little altered from their natural appearance."

In confirmation of Mr. Tomes' discovery, Dr. Beale* says: "The dentinal 'tubes' of a *living tooth* are never empty; indeed, they are not tubes, nor are they canals for the transmission of nutrient substances dissolved in fluid, but they contain a soft solid substance, the central portion of which is in a state of active vitality.

"Imagine, for a moment, one of the soft nuclear fibres of tendon surrounded with a matrix impregnated with calcareous matter, and you will form, I believe, a good idea of the structure of the 'dentinal tube' and its contents.

"The wall of the tube with the matter between the tubes correspond to the 'wall' of an ordinary cell, or to this and the intercellular substance (my *formed material*), and the contents of the tube to the granular cell contents with the nuclei (my *germinal matter*). If you look at the tissue of the pulp just beneath the surface of the dentine, you find a number of oval masses of germinal matter colored intensely red by carmine. These are nearly equidistant, and separated from each other by a certain quantity of material which is only very faintly colored, and in cases when the solution was not very strong it remained colorless. This colorless matrix is continuous with the *intertubular dentinal tissue*, while the intensely red germinal matter, or rather a prolongation from it, extends into the dentinal tubes. The germinal matter, with a thin layer of soft and imperfect formed material, is easily detached from the formed material by which it is surrounded, and its continuity with the dentinal tubes may often be torn away. The whole then appears as an oval mass (cell), with a prolongation as it were into the dentinal tube.

"The general description given of the manner in which these dentinal tubes *open* upon the walls of the pulp cavity is certainly true, but it is true only of the dry tooth. In the living tooth a prolongation from one of the 'cells' on the surface of the pulp is prolonged into each tube. The tubes cannot, therefore, serve as mere conduits for nutrient fluids which transude through the walls of the vessels, and are supposed to pass along the tubes to the outer part of the tooth. Moreover, in some cases certain of the so-called dentinal tubes are completely solid, the tube being obliterated. These points receive a ready explanation from a careful consideration of the facts I have brought forward.

"The specimens which have been sent round prove, I think, that the formation of the dentine and the so-called tubes is effected in a much more simple manner than is usually believed. The elongated masses of germinal matter first of all produce *formed material*, which gradually

---

* The Structure of the Simple Tissues of the Human Body, by LIONEL S. BEALE, M.D., F.R S., p. 137.

increases, as in other cases, upon the outer surface of the germinal matter. The formed material of the adjacent elementary parts is continuous, and calcareous matter is first deposited in the oldest part of this formed material. The calcareous matter appears in the form of small globules, which gradually increase in size, and often several coalesce. Thus the formed material, or matrix, of the dentine becomes calcified.

"*Not unfrequently, however, several of the calcareous globules increase in such a way as to inclose a portion of uncalcified matrix. This being, as it were, imprisoned by hard, impermeable structure, retains its soft primitive state. If the tooth be dried, the soft matrix in these spaces shrinks, and air rushes in. Thus the appearance known as 'globular dentine' is produced, and the reason why uncalcified tubes are seen traversing these spaces becomes manifest.**

"After the matrix of the dentine is calcified, the germinal matter still slowly undergoes conversion into formed material, which, in its turn, becomes impregnated with calcareous matter. The germinal matter diminishes in thickness. The formed material is produced more slowly after the general basis has been laid down, and hence the dentine immediately surrounding the tube seems to be distinct from that lying in the intervals between the tubes. The germinal matter gradually shrinks from the outer part of the dentine (the oldest portion) toward the pulp cavity, where these changes still go on. In the dry tooth the same fact may be expressed by saying that the narrowest part of the dental tubes is at the circumference of the dentine, and this part was the first formed; the widest part is that which is in contact with the pulp, and this is composed of dentine most recently developed. Internal to this is a narrow layer, the formed material of which is not yet calcified."

As evidence of the correctness of the investigations of these gentlemen, I have placed in the field of the microscope a section of dentine with a portion of the pulp attached, in which you will observe a large number of dentinal fibrils projecting from the dentine on one side of the section, and adherent to and projecting from the pulp on the opposite side.

---

* In the italicised paragraph it will be seen that Dr. Beale (who is one of the most laborious, careful, and accurate observers of the present day, and the first to use the high powers now employed, ranging from $\frac{1}{26}$ to $\frac{1}{50}$ of an inch) fully confirms the position maintained by me in relation to the *interglobular spaces*. With no inclination to reopen a discussion on a topic which has been thoroughly settled by specimens prepared by me, that offer the most conclusive evidence of their genuineness, and which have been examined and fully recognized, not by persons unaccustomed to the use of the microscope, but by several of the most eminent microscopists of our country, it may not be out of place to say that those who attribute such appearances to defective mounting, thereby, in the estimation of experienced observers, necessarily invalidate, or cause to be received with many grains of allowance, statements which they may present of observations prosecuted in more minute and intricate directions.—J. H. McQ.

You will observe that by a slight variation in the movement of the fine adjuster, the fibrilla present either the appearance of solid fibres, or assume a tubular character, according as the instrument is moved from or toward the specimen. I have had under daily investigation specimens such as these for weeks at a time during the past few years, and while fully recognizing and freely admitting the undeniable fact that such appearances are observable under the microscope, it is yet a matter of question with me as to the exact character of these fibres. It will be seen that the gentlemen whom I have quoted do not positively assume that they are nerve fibres. Mr. Tomes, though evidently inclining to that view, recognizes the possibility, and fully explains how *sensation* may exist in portions of the human system, or even in the entire organism of the lower order of animals in which the presence of nerve fibres have not been demonstrated. Again, Dr. Beale speaks of these fibres as the *germinal matter*, from which the *formed material* or dentine is obtained. Now, I may ask, is it reasonable to infer that dentine is formed out of nerve fibres? If nerve fibres were distributed to all the dentinal tubuli, every tooth under such circumstance would be exquisitely sensitive not only to the manipulations of the dentist, but even sound teeth would ache when exposed to the varying thermal influences of everyday life; yet we know that all teeth are not sensitive, and the majority can be cut almost to the pulp before exciting painful sensations. Again, it is a well-recognized fact that as persons advance in years, the dentinal tubuli decrease in size, and in many instances become entirely obliterated by calcareous deposit within the tubes. If nerve fibres are distributed to the dentinal tubuli, would not the decrease in size of these tubes, and their subsequent obliteration, be attended by compression of the delicate nerve filaments, and thereby excite the most excruciating suffering?—as in the case of the compression of the branches of the fifth pair of nerves, from osteal or periosteal thickening, and consequent diminution of the size of the foramina through which they pass. Again, if nerve fibres pass from the pulp into the dentinal tubuli, would not the former, by such an arrangement, be united to the walls of the pulp cavity so firmly that it would be next to an impossibility to remove a pulp, either living or dead, as is frequently done by the dental practitioner? In illustration of the slight connection existing between the pulp, you will observe that on holding the incisor tooth (which I have just removed from the calf's head on the table, and then divided longitudinally with a saw) sideways, the pulp drops from the cavity, and is only adherent at the lower extremity of the root, where elongation is taking place. Facts such as these compel me to question the presence of nerve fibres in the dentinal tubuli, and induced me to regard, as I have formerly observed, the dentinal fibrils as a post-mortem result following the extraction of a tooth, and due to the coagulation of the liquor

sanguinis in the tubes rather than a normal condition of a living organ, and therefore to account for the painful sensations experienced by the vibratory theory. While holding such views, I do not wish to be understood as so wedded to my opinions as to be unwilling to change them when convinced that they are erroneous. The agitation, investigation, and discussion of such subjects, when prosecuted by a number of earnest seekers after truth, cannot but prove beneficial to all, and eventuate in an accurate appreciation of the exact condition of things.

ON THE PART PLAYED IN THE CIRCULATORY MOVEMENT BY THE RED-BLOOD CORPUSCLES.

BY PROF. RUFUS KING BROWNE,

PROF. OF EXPERIMENTAL PHY. AND MIC. ANATOMY NEW YORK COL. OF DENTISTRY; PROF. OF PHYSIOLOGY AND HYGIENE NORMAL SCHOOL OF PHY. CULTURE, BOSTON; FORMERLY PROF. OF PHY. AND MIC. ANATOMY NEW YORK MEDICAL COLLEGE.

Until the date of Harvey's discovery of the circulation of the blood, physiology was without a scientific basis. That discovery furnished a sure ground on which any amount of superstructure of facts might be reared. Analysis had not then given to us the composition of the blood. Nor had the microscope enabled us to discern that the apparently homogeneous red fluid was not only a liquid, but consisted, at least half, of peculiarly mobile, soft-solid, minute bodies.

Up to that time, the blood was supposed to "irrigate" the flesh, and was called "liquid flesh," which spread, without any inclosing tubes, amid the recesses of the tissues.

With the discovery of the blood tubes, and the regular round-going of the blood, dated a new era for physiology. The knowledge of the circulation made the further knowledge of every anatomical and physiological fact, appreciable to sense, involved therein, immediately possible and practicable.

Yet our knowledge of the circulation, regarded as a truly *physiological process, transacted by organic substances and masses of substance, in a living state*, and therefore active, continues almost unchanged since Harvey's day. There has always been with professional, still more than with lay mankind, an unworded but rigorous inclemency toward any new doctrine of facts which unseated preceding doctrines however false. This was notably exemplified in Harvey's discovery. For the utterly imaginary notion of the inundation of the tissues by the blood,—"liquid flesh,"—he revealed the fact of the circulation. Yet his professional cotemporaries at first ignored, derisively contemned, and then denounced it as false. For nearly a score of years utterly and intentionally ignored and unnoticed by his scientific cotemporaries, intent only upon keeping up their own private reputation, Meyer of Heilbron exercised his great creative in-

tellectual power in developing his discovery of the "conservation of force"—a doctrine now continually lauded as the very greatest achievement of the scientific mind since the world began. And this will always be the case, let but similar occasion arise, whether with scientific or merely empirical mankind, whether professional or lay, but especially in the former case, where ignorance *rules in the absence of knowledge.* Mentally considered, such antagonism to scientific truth is as puerile as infantile willfulness, and as obtuse as the hardened clod, but conventionally it is for a period, not eventually, all-powerful to preclude the access of truth.

Following the acceptance of the doctrine of the circulation, came numerous researches into the composition, analytically estimated, of the blood fluid, considered as a store of supply of nutritive material to the tissues of the body. From them came the knowledge that this fluid was the source of the sustenance of the entire mass of the organism, and that its nutritive elements really came in contact with the tissues by transudation through its containing channels.

Afterward, by means of the microscope, we discerned, so far as appreciable to sense by its aid, the anatomical characters of the blood. By this means we saw it was composed or made up in great part of an incalculable number of soft-solid, red bodies. The peculiar office of these little bodies was long suspected by observers, from the circumstance of their regularly undergoing two changes of color during their round of the circulation; and in the most recent time it has been demonstrated that they *alone* are the appropriators and carriers of oxygen from the air in the lungs.

Whoever is conversant with the literature of the subject of the circulation, need not have failed to perceive that it nowhere evinces the slightest suspicion that there is any character in the propagation or movement of the red-corpuscles, really different from that of the blood fluid. Nor need they have failed to perceive that physiology, on the showing of her own literature, and of her learning pertaining to the circulation, has not yet come into possession of *either a certain or determined belief, much less appreciation or knowledge, of* the true character of the propagation of the blood, from stage to stage of its round, so far as these are either appreciable by optical means to sense, or demonstrable to *the mind.* This is evident not alone because of the mutual contradictions presented in descriptions of the circulation, but notably because no one of these in itself has a certain and determined character, except negatively as a contradiction. In other words, none of them have the character of a representation of facts.

Soon after Harvey's discovery, physiologists were impelled to inquire for a *cause* of the circulation. Some doubted that the impelling power of the heart was sufficient to account for propagation of the blood over

its round, and some denied that it was so. The latter, with a clod-like want of mental power, to appreciate the plain and certain fact that the heart *did* incessantly impel the blood, discarded any reference to it as a cause, and adduced "capillary" power and "attraction" as sufficient to account for the circulation. Yet no word was uttered which indicated the slightest suspicion that there was *any power of movement attributable to any of the elements of the blood itself*, or that any of these elements could advance so much as by a hair's breadth, beyond the point where the impelling power of the heart found and carried them. Though there has long been evident many observed facts which disprove this negative error, yet observers are as far from a true understanding or appreciation of these as ever; and of the deniers that the heart alone was the sufficient cause* of the circulation, no one of them suggested that if any other conditions in unity with that of the heart's contraction existed, these must be looked for within the physiological character, quality, or power of the *elements of the circulation themselves.* To no constituent of the blood has been attributed any force as a physiological quantity,—any phenomenal power, or power of evolution incident to it, but only an utter passivity to exterior and extrinsic influences.

Nominally or verbally, that is, apparently only, we have assigned to its fluid an uncertain power of chemico-physiological *change* which its ingredients underwent, the whole power supposed, being in reality exerted by some chemical power, the blood itself being the passive subject of the *effect.*

But to the blood itself we have never attributed any influence upon its course, nor any but a passive quality, in fulfillment of the *ulterior* purpose of the circulation.

The inevitably certain test of our opinions upon scientific as well as other problems, will be found in the contradictions identified with them; for whenever and wherever these appear, we may be certain that we have not discerned the truth in the case.

Since the discovery of the circulation, not only has the most marked uncertainty existed as to the true character of the transactions in the blood channels, so far as appreciable to sense, but the most peculiar confusion, inaccuracy, and distinct contradictions, one statement of another, exist in the accounts current of the supposed facts.

In descriptions of the blood in its channels, sometimes, for instance, the plasma is represented to occupy the position of a "still layer" adjoining the sides of the vessel, the red-globular soft solids between the layers, and this is called the "anatomical division of the blood:"—implying a

---

* Of course, what is meant by "cause" here, is simply the constituting *conditions;* for cause in any other sense never has been and never can be recognized in material effects.

distribution of the fluid and the wet-soft solids, the latter flowing through and in the midst of a stationary fluid channel.

Sometimes this "still layer," or stationary channel formed of fluid, is alluded to as if the idea was used for the necessary purpose of description, *not* as if it were indeed a fact, but as if its existence were dubious, and more than doubtful. Sometimes it is represented that the stationary state or "still layer," which is now an undoubted fact, is accounted for by "capillary attraction," as shown in experiments by tubes. Sometimes a portion of the liquor sanguinis is represented as moving in the central part of the vessel, while in the same description it is said the "plasma occupies the position *next the walls of the vessel.*"

Sometimes it is represented that the corpuscles are *floating* in a plasma, which forms a "*distinct layer* next the walls of the vessel," indirectly contradicting a previous statement that there is plasma in the axial portion of the vessel, and denying there is any there, or any corpuscles there. Sometimes it is stated that "in vessels of considerable size, *as well as the capillaries,* the *corpuscles* occupying the central portion move with much greater rapidity than the rest of the blood," a statement in contradiction of a subsequent one, that "the corpuscles move *with* the central current,"—"the rest" of the plasma being thus distinctly referred to as moving, but with less rapidity, while just before it had been pronounced "still" or stationary.

Again, in the same sentence, it is said that a rapidly moving portion leaves "a layer of clear plasma at the sides, which is *nearly immovable,*" thus explicitly contradicting the repeated statement of the "still layer."

Sometimes the corpuscles alone are referred to as occupying the centre of the vessels, and *they* are now said to be moving rapidly through the midst of the "still layer," and then said to be "carried along *with* the central current" (a distinction being made as to the portion of the stream occupied by the globules,—though any specification as to whether the blood forming this current consists wholly of a crowd of globules, or of plasma besides, is not made); and sometimes "a central current" having been specified, it is thereby impliedly specified that *side* currents too exist, while this side portion in the majority of cases in which it is named is called the "still layer."

In the presence of facts of life, of the character of which any close observer may assure himself, are we not bound to acknowledge that we still need to ascertain what the actual physiology of the circulating substances is? Seeing that any scientific belief is entirely unmade up about it, should we not be willing to look for facts to supply this long-existing defect in our knowledge? Most of those who write upon the physiology of the circulation, appear to have never really given the subject thought enough to even notice these contradictions (and yet they are accredited as medical teachers, with a full knowledge of physiology), while others

ignore these palpable defects in our knowledge of the most important of transactions in the organism, under the impression that by silence they conceal their ignorance. But how is it possible for us to get even a glimpse of the nature and conditions of various morbid processes, the origin of which we instinctively refer to changes occurring, not in the composition, but in the character of the movement of the blood, without first ascertaining what the normal character of that movement is? Whether, indeed, it is the same for different constituents of the blood, or whether one *portion* of the blood flows, while in the same time and vessel another portion is still and stationary. No anatomical or physiological inquiry can possibly excel this in importance, and none can have a more direct and positive bearing upon the advent of various diseases.

The existence of a "still layer" of plasma is supposed by some to be a fact of *observation*, while others are shown, as in the preceding contradictions, alternately to doubt it and to cite it as an observed fact. Some believe that as there is *apparently* no movement of the plasma near the sides, this absence of a sight of the movement constitutes a fact of observation. But a fact of observation is always and invariably what we do see, not what we do *not* see. This latter is precisely what is *not* a fact of observation. In reality, this imagined "still layer" is not a fact, but an *error* of observation. All the fluid in the blood channels moves. It is well known to microscopists that in the case of a fluid like that of the blood, seen microscopically, the flow or *movement* could not be the subject of eyesight, but only particles or bodies moving in the fluid could be. It is their change of position or transit we *see*, and from that infer the movement of the fluid they are in. If, therefore, we should remove from the blood the corpuscles, we should not be able by *sight* to recognize its flow at all. Nor of course could its *rate* of movement be appreciable to sight; yet when having called the plasma a "still layer," we explicitly and positively contradict ourselves, and repudiate that statement by calling that layer "nearly immovable," or as the Germans do, a "sluggish layer;"* we assume to have made this

* The Germans name this the "sluggish layer," not because of an idea that there is any movement in the blood itself, except as it is passively moved by the heart, but because this designation represents the plasma at the sides, as compared with the tumultuous movement of the portion where the globules mainly appear. Precisely so when the globules are alluded to in one of the above contradictions as "moving rapidly," the difference in movement between the central portion of the stream and the side layer, which is already given in calling the latter the "still layer," is what is intended. Neither implies the slightest suspicion that there is or could be any difference of rate of movement between the soft solid bodies and liquid of the blood, but only between different *portions* of the blood without distinction, except as respects the relation of the stream to the parts of the interior of the tube. In the second description the globules are mentioned as occupying the central portion of the tube, simply because as a *fact* they are found together in that

rate of movement a fact of observation—so showing the entire unreliability of our representation of facts, or showing how little, if any, understanding of facts we possess, derived from what we have termed observation of the circulation.

But the assertion of the existence of this "still layer" of plasma, while contradictory of another assertion that it is "sluggish" or "nearly" immovable, is specially contradicted by the statement of another fact of observation, namely, that the white-blood corpuscles move forward in it. Our notion, so far as we had any distinct state of mind concerning this point relating to the circulation was, that it was the fluid moved, and the corpuscles only moved by it. But it is affirmed that the side portions of the fluid are "still," while corpuscles move forward in it. This is another contradiction. Can a fluid be still in which corpuscles are found moving, yet which, we affirm, are only moved *with it?**

But if we take our choice of these contradicting statements respecting the blood, considering them, not with reference as contradictions one to another, but as descriptive statements, we shall find that none of them represent either the facts as they *are*, or the *truth* of the facts. For there are none of them significant in the slightest degree, that there is any phenomena of active character in the circulation, which is due to its own constituents. Most of these descriptions were written many years since, and then the observations on which they were based were made on a single species of animal. Succeeding authors, down to the very latest, have continued these descriptions, and repeated the old observation. Beyond this, no one has really and certainly attributed to these elements the performance of work of a true *physiological* character, depending, of course, on the impulsion of the heart, but involving in some of them a positive quality as organs.

The physiologist has been content to rely upon the pretended explanation of the chemist or the physicist, apparently without the least reflection. This class of men have always attributed to the whole blood qualities which simply fitted it to be passive or subservient to physical forces or law. Not until we cease this perversion which knows not physiology in its own domain, shall we correct our present predicament.

---

portion, and not because *they* are suspected to have any movement except that of being carried, as in themselves passive bodies, by the fluid. This is *proved* by the fact that under the same circumstances they are also described as "moving *with* the central current."

* Of course, if we accredit these contradictory statements as representations of facts, and the latter as the true results of observation, on the "practice" in vogue, on which we assent to the "no" which contradicts "yes," and *vice versa;* or on that other common practice, assent to both at once, the no which contradicts "yes," and the yes which contradicts "no," then all contradictions in reports of our observation of the circulation are already settled, so far as their acceptance is concerned.

The least attention on the part of the physiologist to the facts of the circulation, will be sufficient to convince him that the pretension of the chemist to explain these phenomena by physical laws has been idle and puerile from the first.

Let us now vindicate this assertion.

The chief function of the red-blood corpuscles has been demonstrated in the latest time to be to take oxygen from the air in the lungs. Though they do this, their substance is not thereby *oxidized.* To say that it is, would be to obliterate the exact purport of terms. For the oxygen they have taken up, they release again before they complete the circuit, and what is more, as indicative of the true character and import of the events, is, that they release or give it to the very fluid they are suspended in, which, together with them, was presented to the oxygen at the lungs, without the latter taking action on it. To the activity of the oxygen has always been attributed the entire play in this transaction; but it is in vain to pretend that this phenomena falls under the head of oxidation. Moreover, the red globule only takes up at the lungs a portion of the oxygen it incorporates in itself, and only releases that portion between capillaries and veins. Of course, the oxygen must be brought to the situation of the globules; they cannot leave that field to go to it; but the character of the phenomena is not one of *oxidation.* But why should there be this difference between the behavior of oxygen in this, and its other relations to different substances? To this inquiry there is, luckily for the truth, an unavoidable answer—the only possible one. What can it be, seeing that there is but *one* other substance besides the oxygen which is a party to the transaction, but that substance itself, namely, the substance of the globule.

(To be continued.)

DENTITION: ITS PATHOLOGICAL AND THERAPEUTIC INDICATIONS.

BY GEO. W. ELLIS, M.D., D.D.S,

LATE PROFESSOR OF DENTAL PHYSIOLOGY AND OPERATIVE DENTISTRY IN PHILADELPAIA DENTAL COLLEGE.

[Continued from page 24.]

Having seen how improper nourishment retards general development, and aware that the teeth, during the first weeks of infancy, are exceedingly soft and vascular, we can easily understand why an absence of that pabulum which they so earnestly require should produce imperfect structure, abnormal eruption, and maladies consequent upon these aberrations.

Impressed then with the fact that malnutrition is among the prominent causes of imperfect tooth structure and irregular eruption, it becomes necessary to know what kind of food is best adapted to the period of dentition.

Previous to the eruption of the milk teeth, the food must of course be fluid, as the masticatory movements are not acquired until suggested by the presence of antagonizing dental organs; when, however, their eruption is fairly initiated, it seems an indication for the commencement of a gradual increase in the substantiality of diet.

The error in the selection consists mainly in the choice of food deficient in the earthy and nitrogenous elements, as for instance rice, arrowroot, corn starch, farina, spoon-victuals made out of the dry husks of bread, etc. Upon these the infant cannot flourish, and the teeth, which, for their development, require such different materials, fail to attain perfection in form or density.

Where the bottle is resorted to for the nourishment of the child, it should at first consist of about one-third milk, which, at the age of four or five months, may be increased to one-half milk, and at the commencement of teething, may be given without any dilution. At this age a small quantity of beef soup or chicken broth may be advantageously given, care being taken, however, to so regulate the strength that it may prove acceptable and manageable to the digestive organs.

The nourishment is generally administered to the new-born infant every hour and a half or two hours; when advanced, however, this interval may be increased to three hours or more, the quantity of milk also being increased; the formation of the infantile stomach is at first such as to preclude the retention of any great amount of food; it gradually approximates the adult organ in form, assuming well-defined curvature, and its capacity at six months is such as to insure the retention of food sufficient to appease the pangs of hunger for about three hours.

The amylaceous substances are frequently employed for thickening the milk, upon the supposition that increased consistency must necessarily insure increased nutritiveness; this idea, however, is very erroneous, and instead of accomplishing good, actually works harm, as we have already observed, by impairing the action of the intestines and function of the liver, thus producing in some cases obstinate and very painful constipation.

Where the child is fed from the bottle, the utmost cleanliness with respect to this vessel should be observed; it should be washed after each using, and filled with water until again required; the same care should be exercised with the artificial tube or nipple which is now mostly constructed of India-rubber, for if a small quantity of milk be left coating the sides of either, it will readily sour and act upon that which may be put in contact with it, as "the little leaven which leaveneth the whole lump."

From the irritating nature of sour milk upon the alimentary tract, it becomes necessary in very warm weather to take precautionary measures against this change, which consists in boiling the milk; it must be borne in mind, however, that this alters the property of the fluid somewhat, so

that it exerts a constipating influence, a condition easily corrected by the general remedies for such difficulty.

In the poor, from deficient provender, or in the rich, from a perversion of the assimilate functions consequent upon luxurious abuses, the milk is bare of its normal rich ingredients, and favors a degeneration of the dental nutrition of the child.

The first secretion of milk, which is established at the end of a day or two after delivery, is a yellowish, turbid mixture called the *colostrum;* it appears thin, although examination proves it to be more abundant in solid matters than the ordinary fluid, containing a multitude of large granulated corpuscles.

This *colostrum* has a purgative effect upon the child which is beneficial in clearing the bowels of the meconium which fills them at birth, and the necessity of the exhibition of a medicament for the same purpose is obviated; it may, however, retain these properties abnormally long, with a very injurious effect upon the infant; if such a condition exist it is easily detectable through microscopical scrutiny. After a day or two's continuance of this discharge, it is replaced by the true milky secretion, which is, however, by no means fixed in its composition, for "Simon found that the constitution of the milk varies from day to day, owing to temporary causes; and also that it undergoes more permanent modifications, corresponding with the age of the infant. He analyzed the milk of a nursing woman, during a period of nearly six months, commencing with the second day after delivery, and repeating his examinations at intervals of eight or ten days. It appears, from these observations, that the casein is at first in small quantity, but that it increases during the first two months, and then attains a nearly uniform standard.. The saline matters also increase in a nearly similar manner. The sugar, on the contrary, diminishes during the same period; so that it is less abundant in the third, fourth, fifth, and sixth months than it is in the first and second. These changes are undoubtedly connected with the increasing development of the infant, *which requires a corresponding alteration in the food supplied to it.* Finally, the quantity of butter in the milk varies so much from day to day, owing to incidental causes, that it cannot be said to follow any regular course of increase or diminution."

As previously remarked, the milk of the cow offers the most available and at the same time a very excellent substitute for the human secretion, if care be taken in its proper dilution, and the addition of a little sugar to compensate for its saccharine deficiency, which is about 30 parts, while the human milk contains about 48.

When an early cessation of the mammary secretion is apprehended, it is deemed advantageous to commence the gradual substitution of the bottle, giving it say at first once a day, and progressively increasing until entire independence of the parent is established, always gradually dimin-

ishing the proportion of water and sugar in accordance with the changes observed in the mother's milk during the continuance of lactation.

Human milk, without deficiency or permanent vitiation, may be temporarily contraindicated; for, like other secretions, it is very strongly and often very promptly influenced by nervous impressions, and it has been said that sudden emotions have so altered its properties as to have occasioned in the infant indigestion, diarrhœa, convulsions, and even death.

Says Sir A. Cooper: "The secretion proceeds best in a tranquil state of mind and with a cheerful temper; then the milk is regularly abundant and agrees well with the child. On the contrary, a fretful temper lessens the quantity of milk, makes it thin and serous, and causes it to disturb the child's bowels, producing intestinal fever and much griping. Fits of anger produce a very irritating milk, followed by griping in the infant, with green stools. Grief has a great influence on lactation, and consequently upon the child. The loss of a near and dear relation, or a change of fortune, will often so much diminish the secretion of milk as to render adventitious aid necessary for the support of the child. Anxiety of mind diminishes the quantity and alters the quality of the milk. The reception of a letter which leaves the mind in anxious suspense, lessens the draught and the breast becomes empty. If the child be ill, and the mother is anxious respecting it, she complains to her medical attendant that she has little milk, and that her infant is griped, and has frequent green and frothy motions. Fear has a powerful influence on the secretion of milk. I am informed by a medical man, who practices much among the poor, that the apprehension of the brutal conduct of a drunken husband will put a stop for a time to the secretion of milk. When this happens, the breast feels knotted and hard, flaccid from the absence of milk, and that which is secreted is highly irritating; and some time elapses before a healthy secretion returns. Terror, which is sudden, and great fear instantly stops this secretion."

The two following cases are related to prove that violent mental agitation may impart to the milk an actually *poisonous* character: "A lady having several children, of which none had manifested any particular tendency to cerebral disease, and of which the youngest was a healthy infant a few months old, heard of the death (from acute hydrocephalus) of the infant child of a friend residing at a distance, with whom she had been on terms of close intimacy, and whose family had increased almost contemporaneously with her own. The circumstance naturally made a strong impression on her mind; and she dwelt upon it the more, perhaps, as she happened at that period to be separated from the rest of her family, and to be much alone with her babe. One morning, shortly after having nursed it, she laid the infant in its cradle, asleep and apparently in perfect health; her attention was shortly attracted to it by a

noise, and on going to the cradle, she found her infant in a convulsion, which lasted a few moments, and then left it dead.

Case 2d. "A carpenter fell into a quarrel with a soldier billeted in his house, and was set upon by the latter with his drawn sword. The wife of the carpenter at first trembled from fear and terror, and then suddenly threw herself furiously between the combatants, wrested the sword from the soldier's hand, broke it in pieces, and threw it away. During the tumult, some neighbors came in and separated the men. While in this state of strong excitement, the mother took up her child from the cradle, where it lay playing, and in the most perfect health, never having had a moment's illness; she gave it the breast, and in so doing sealed its fate. In a few minutes the infant left off sucking, became restless, panted, and sank dead upon its mother's bosom. The physician, who was instantly called in, found the child lying in the cradle, as if asleep, with its features undisturbed, but all his resources were fruitless. It was irrecoverably gone."

When there is no manifestly vitiated condition of the milk, but simple deficiency in quality or quantity, the practice universally indorsed and adopted, in view of its inestimable value as infantile food, is to perseveringly employ every measure which promises to restore its normality, for "Nature does not afford, nor can art supply any substitute."

The existence of a strong desire to furnish milk, coupled with the irritation of the nipple by the sucking efforts of the infant, will, in many cases, prove sufficient to establish a free draught, and even where some temporary debility or ailment has compelled the suspension of nursing, it has proved adequate to its restoration.

It has been stated by Dr. McWilliams, in his report of the Niger Expedition, that the inhabitants of Bona Vesta, in cases of emergency, secure a wet-nurse by fomenting with the leaves of the "jatropha curcas" the breasts of any woman who has once borne a child, and is still within the age requisite for the performance of that function.

When, however, these minor efforts fail, it would be advisable to recommend and employ electricity, in some form, for the restoration of the lacteal secretion. You might very naturally ask whether I have had any experience in its use for this purpose, to which I would reply, no, but would add, that the testimony of a number of reliable and valued medical friends in its favor, together with the knowledge of its peculiarities, acquired through considerable reading and experience, would lead me to anticipate from it the most prompt and gratifying results.

It seems to possess that ready convertibility into the nervous force which enables it so happily and harmlessly to rouse the functions which may be partially or wholly suspended.

When there is a deficient, suppressed, or poor secretion of milk, or any abnormal condition of the active mammary gland (except inflammatory),

by its action through the nerves and vessels, it will quickly produce a corrective effect.

The preference is usually accorded the primary galvanic current, although I am cognizant of the most satisfactory impressions following the use of the electro-magnetic battery as recently improved. When either is employed, care should be taken to render it mild and agreeable, for its influence for good cannot be estimated by the amount of external manifestation, as the most undemonstrable in-working is usually the most beneficial. The positive pole should be placed *above* the breast or in the axilla, while the negative is placed upon the breast, and the current kept as even as possible.

M. Becquerel reports the case of a lady 27 years of age, who had the left breast almost entirely dried up, and the secretion from the right greatly diminished. He employed the induced electro-magnetic current, directed through large sponge electrodes, and made to traverse the breast in all directions. After three sittings, of fifteen minutes each, the flow of milk was abundant, and so continued until the child ceased to nurse.

INFERIOR MOLAR PULPS.

A paper read before the New York Society of Dental Surgeons.

BY C. E. LATIMER, D.D.S.

About two years ago I commenced a course of investigations with a view of determining the size and shape of pulp canals in the different classes of teeth, during which I discovered what was to me a new thing in regard to the anatomy of these organs, viz.: that the inferior molars, instead of having but two pulp canals, frequently had three, and sometimes even four.

This being totally different from what I had formerly been taught, I thought it might at least be new to a part of the profession, and therefore communicated the facts to the readers of the Dental Cosmos. Some ridiculed the idea, while most gave it little thought, but kept on in the same course as formerly, being content if two canals were found and filled. I doubt not the great mass of the profession, if inquired of concerning this matter, would be obliged to answer as did those disciples at Ephesus when Paul asked them if they had received the Holy Ghost since they believed, and who replied: "We have not so much as heard whether there be any Holy Ghost." In order, therefore, to stir up a spirit of investigation, I will give the result of my examinations in this direction since the publication of the article referred to.

Unfortunately for all such research as this, I do not get half as many nor as good teeth to saw up as I used to, for Dr. Atkinson persists

in teaching, in his peculiarly forcible manner, that we must save *every* tooth, however diseased, as long as there is a root to build a crown upon, or a crown to build a root upon.

However, as he will have to give account for this, as well as a great many other things, I need not dwell upon it here further than to remark, in a private way, to the lost sheep of the house of Israel, who have not yet recognized the necessity of coming into the fold of dental societies, that if they would ever wish to stand *au fait* among their professional brethren, they must never confess to having sacrificed a tooth, or ever to have even seen a pair of forceps.

But to the subject. I have succeeded in getting fifty inferior molars, which I have classified by first noting the age of the tooth when extracted, size of foramina, number of canals after cutting off the ends of the roots, then the number after cutting off the roots near the bifurcation. The result is as follows: number with but two canals, 10; number with three canals, 31; number with four canals, 8.

One reason why the proportion of these figures differs from that given in my former report is, that in my first examinations I did not cut off the ends of the roots, hence those in which the bifurcation was progressing from the apices upward were counted as single.

One object which I had in view was to determine where the separation of the pulps began; but in this particular the facts prove that the theory which I had founded upon my previous examinations had its exceptions. Among the pulps examined that were in process of separating by a deposition of dentine in the canals, nine began to divide at the apices of the roots, and six at the coronal portion, giving a proportion of three-fifths in favor of the theory I advanced, with the very liberal exception of two-fifths. This may serve to show the propriety of learning the facts first and founding theories afterward.

The average length of time the teeth having two pulp canals had been erupted was seven years, while those having four had been developed nine years, and those with three canals fifteen years. Only one of the number having but two canals was a sixth-year molar, showing that we may but rarely find one of these teeth with less than three canals either formed or in process of formation.

I find it impossible to classify the sizes of foramina so as to make it intelligible upon paper, but would earnestly advise all to systematize their investigations upon this point, assuring them that the knowledge thus gained will be of great benefit when removing pulps and filling canals, or in the treatment of alveolar abscess.

It would be an interesting field for research for some of our amateur microscopists to examine into the process of forming two small pulp branches from a single one, and see how it is so nicely divided as to leave in each canal a nerve, an artery, and a vein, each enveloped in its own peculiar membranes.

A more practical, though not more interesting, question for us to consider is, how is this metamorphosis from two to three, or even four canals, going to affect our treatment and practice?

It is very evident, from these examinations, that we cannot determine positively, either from the age of the teeth or their general conformation, at what time the ossific deposit has progressed to such an extent as to divide the canals We must therefore *always* search for two canals in each root of inferior molars, and especially in the anterior root, when, if the calcification shall have produced bifurcation of the pulp at the lower end of the root, we shall have no trouble; but if the upper part is divided, leaving the lower portion still connected in one broad pulp, we shall find it exceedingly difficult, if not utterly impossible, to remove all of it through these small canals.

What, then, is our best course, after removing all that we can of the pulp? Certainly not to crowd a pellet of cotton, or even gold foil, down there; for these would serve to press the remaining portions of dead pulp down to the foramen, where they would be in the worst position possible to do mischief. For several years I have been wishing for some better method of filling inaccessible roots, and have experimented with gold and platinum made into broaches as nearly as possible of the size and shape of the canals, but these did not please me, and I abandoned them. About ten years ago a Western man (if I mistake not, Dr. Forbes, of St. Louis) gave, through the dental journals, his method of filling roots with steel broaches. This plan, so far as I am aware, was not adopted to any extent, for the very good reason that the steel thus exposed will oxidize and blacken the tooth; but I have used broaches when tightly wound with gold foil with very good results. 'Tis true that the great majority of roots may be filled quite readily with gold foil, and where the roots are accessible, this should be done; but cases occur in which it is exceedingly difficult to find and extirpate the pulp with the finest broaches; then we may close such delicate, tortuous canals very effectually with the same broaches, if well protected with gold foil to prevent discoloration therefrom.

EXPRESSION IN ARTIFICIAL DENTURES.

BY F. K. CROSBY, D D.S., LYNN, MASS.

It is a noticeable fact, that with a large proportion of our patients the *appearance* of an artificial denture is the subject of more solicitude than the difficulty to be experienced in mastication, or the prospect of trouble in wearing. That this is especially true as regards the gentle sex, few, in the face of experience, will be sufficiently chivalrous to deny. Bearing this in remembrance, it is surprising with what utter disregard

of the rules of expression so large a number of artificial sets are constructed at the present day. With many practitioners the same unvarying model is followed in the arrangement of the teeth, leaving only the shade and size to be determined by the requirements of the case, while some ignore all discrimination even in these particulars, and insert teeth of the same size, shape, and pattern in each and every instance. It is a profitable and interesting study to consider the relations of each tooth or class of teeth in a normal arrangement. One subsequent work will give evidence of the artistic improvement to be thereby gained.

The shade and size of teeth may be advantageously studied in connection with the subject of temperament. With patients, in whom the bilious type prevails, we shall find required the dark or bluish tint, and long, narrow shape, not so strongly marked in the latter particular, however, as in the purely nervous temperament, where the teeth are almost invariably narrow, whether dark or light in shade. Where the sanguine temperament predominates the length should be less marked in relation to the width, and the shade should approximate to white, with a yellowish tinge. The lymphatic patient usually requires a short, broad tooth, though in a few cases of this type we observe the natural teeth longer and not so broad, presenting the appearance attributed to those of the sanguine temperament. The color is white, often chalky, but sometimes exhibiting the pearly gloss and glistening enamel peculiar to young females of a scrofulous habit, who may almost be said to have a temperament of their own.

In the consideration of the *arrangement* of the teeth, we need devote but little space to suggestions concerning the central incisors. Mere instinct, should judgment be wanting, would seem capable of arranging these teeth properly. It may be remarked, however, that the leaving of a little wider space between them than is presented between the other teeth tend considerably to lessen their artificial appearance. Their cutting edges should of course be plane with each other. A singular disposition was observed last winter among some of the students in the laboratory of the Philadelphia Dental College, to set, not only single centrals, but entire blocks, in such a position that the cutting edges of the two blocks formed an obtuse angle, apex upward, an arrangement not often authorized by the example of nature.

To the lateral incisors belongs more of the responsibility of a perfect expression than is generally accorded them. The peculiar cast of the countenance will assist us in their arrangement. Should the face be markedly thin, the best result will be obtained by throwing the laterals slightly in. If it is noticeably round and full, they may be set directly up to the line of the centrals, and sometimes a very little in advance of it. The body of the tooth may project if the cutting edge does not, thereby obtaining the desired expression of fullness.

The canines, in the blocks manufactured for rubber-work, are usually lacking in that prominence which a natural expression demands. Could the body of the tooth be thrown out, and at the same time twisted so as to present more of the mesial surface to the eye, the improvement would be at once apparent. In setting single teeth, where these details can be carried out, we may throw the neck of the canine a little back toward the bicuspids, giving it more "hang" or "draw" than is observable in the blocks, and with a better effect.

In a majority of cases, the intensely artificial appearance presented is owing to a too great projection of the bicuspids. As blocks are now manufactured, if we set the gum surfaces of the front and bicuspid blocks perfectly even with each other, the bicuspids will usually be found altogether too prominent, giving the peculiar ghastly appearance so often complained of, and at once stamping the work as artificial. The twist of the canine, mentioned above, would tend to remedy this defect by partially concealing the bicuspids, but as that is not attainable, it is my own practice, and I believe the preferable one, to set in the bicuspid block, regardless of the jog or shoulder thereby produced.

The molars may be said to naturally gravitate to their own positions. It is, however, a common practice, especially where a double set is being adapted, and there are consequently no natural lower teeth to serve as a guide, to make the upper molars too long. In the natural arrangement we often find them considerably shorter than the bicuspids, the cutting edges of the teeth from the second molar to the lateral occasionally describing quite a curve. We also find the molars so inclined that the inner tubercles are considerably lower than the outer. In the artificial denture the reverse is frequently the case.

With regard to the lower teeth, we may remark that they are so little exposed to view, in comparison with the upper, that much less difficulty is experienced in securing their correct expression. Excessive length of the six oral teeth is, however, sometimes met with. A slight crowding of the incisors produces a remarkably natural appearance, but in the employment of blocks it is of course impracticable, and with single teeth most practitioners seem unwilling to depart from mathematical exactitude in their arrangement.

A word of warning concerning the selection of the shade may be appropriate. We should bear in mind the fact that the teeth will appear whiter when placed in the mouth, from their contrast with the red color of the lips and the darkness of the mouth generally. It is the universal experience that our lady patients are prone to desire teeth of a much lighter shade than a natural expression would possibly admit of. By yielding to their wishes in this respect, we shall, in the end, do ourselves more injury than following the dictates of our own judgment, at the risk of incurring their temporary displeasure. In the latter event, we may at

least enjoy the consolatory reflection that we have done all in *our* power toward limiting the progress of female vanity, "a consummation devoutly to be wished."

THE MICROSCOPE.

BY J. S. LATIMER, D.D S.

In a former paper (vol. viii. p. 630) I mentioned a few of the uses of the microscope. I now propose to speak briefly of the history of this wonderful instrument. But first, let me premise by saying that the simple microscope is formed of a single convex or plano-convex lens, while the compound microscope is composed of not less than two lenses. The compound, achromatic instrument is an invention of comparatively recent date.

"The earliest convex lenses of which we have any account were brought from the East. Among the strange fruits of Layard's labors in the midst of the ruins of old Nineveh, not the least singular was the discovery of a plano-convex lens of rock crystal. Seneca, in the first Christian century, alludes to the magnifying power of a glass globe filled with water, and thus rendering the smallest letters of the alphabet larger and more distinct. But at this time lenses of glass were chiefly used as burning or reading-glasses, and it was only about the beginning of the seventeenth century that even the simple microscope was used to enter upon the field of those great discoveries which the more elaborate compound microscope has effected in our day."

Authorities disagree as to the first discoverer of the single microscope. It has been claimed for Roger Bacon, who was said to have exhibited at Oxford, in the thirteenth century, such extraordinary appearances as to have gained the reputation of dealing with the powers of darkness; but it is more than probable that the ancients were acquainted with its use. Ptolemy, in his "Optics," has inserted a table of the refractions which light experiences under different angles of incidence in passing from air into glass. This and many other facts leave little room for doubt. In 1621 a compound microscope was used in England, but it would hardly be recognized as a microscope at this day, as it was composed of a gilt copper tube not less than six feet in length, resting on a frame of brass and ebony.

Until about the year 1820 the microscope was little more than a scientific toy. Previously to this two great obstacles prevented the development of its powers; and of these impediments (*spherical aberration* and *chromatic aberration*) I purpose speaking in a future paper.

"In 1738, Lieberkuhn's invention of the solar microscope was communicated to the public. The vast magnifying power obtained by this instrument, the colossal grandeur with which it exhibited the 'minutiæ of

nature,' the pleasure which arose from being able to display the same object to a number of observers at the same time, by affording a new source of rational amusement, increased the number of microscopic observers, who were further stimulated to the same pursuits by Mr. Trembly's famous discovery of the polype."

In 1815, Amici proposed and caused to be made for him an achromatic improvement, and the same gentleman subsequently gave a great deal of attention to the investigation of polarized light and the adaptation of the polarizing apparatus to the microscope.

About the year 1823, M. Selligues, of France, produced an achromatic objective, composed of four compound lenses, each consisting of two lenses, and on the 5th of April, 1824, he presented to the French Academy of Sciences a microscope constructed on this principle.

Sir David Brewster having called attention to the fact that lenses of glass soon oxidize, and recommended the employment of the diamond in place of glass, Mr. Pritchard made two plano-convex lenses from a diamond, one of the twentieth and the other of the thirtieth of an inch focus.

In 1826, Professor Amici, of Modena, invented and exhibited in England and France a horizontal microscope, "in which the object-glass was composed of three lenses superposed, each having a focus of six lines, and a large aperture." This microscope had also extra eye-pieces by which the magnifying power could be increased.

Mr. Jackson Lister, of England, in 1829, cemented a plano-concave flint lens to a convex with balsam of fir, which diminishes greatly the loss of light from reflection, and increases the clearness of the field and vividness of the picture.

Subsequently, Mr. Ross and others succeeded in balancing or destroying the errors of sphericity and dispersion to such an extent that the thinnest covering glass between the object and the lens sufficed to disturb the corrections, if the objective had been corrected for uncovered objects, and greatly impaired the definition; but Mr. Ross finally overcame this difficulty by an arrangement for adjusting or moving the front lens nearer to or farther from the object. This improvement he communicated to the Society of Arts in 1837.

Since then improvements have been constantly making in the manufacture of lenses, until we have fiftieths from the establishment of Powell and Leland, and each advance of the manufacturer has been followed by new discoveries in science.

"In 1855, when the jury on microscopes, at the Paris exposition, were comparing the rival instruments, Professor Amici brought a compound achromatic microscope, comparatively of small dimensions, which exhibited certain striæ in test objects better than any of the instruments under examination. This superiority was produced by the introduction of a

drop of water between the object and the object-glass." These objectives have since been made in Paris, and known as the Hartnach lens. At the late exposition in Paris they took the highest premium, and they seem likely to cause a complete revolution in the manufacture of objectives.

One of Hartnach's objectives having been put into the hands of Mr. William Wales, of Fort Lee, New Jersey, that gentleman, seeing the excellence of the principle involved, engaged enthusiastically in the work, and in his first attempt made a fifteenth which excelled the French glass in both excellence of finish and working qualities. His next essay was a fortieth, and in this his success was wonderful. It not only worked admirably as an immersion lens, but, by a peculiar device, it is readily changed from a wet to a dry or from a dry to a wet lens.

It now remains to apply the immersion principle to low powers, and the crowning triumph will have been reached. Microscopy is now enjoying one of its periodical advances, and the demand for these invaluable aids for scientific research was never greater, in this country, than now.

MICROSCOPY OF THE TEETH.

BY S. P. CUTLER, M.D., D.D.S.,

PROFESSOR OF CHEMISTRY AND MICROSCOPY IN THE OHIO COLLEGE OF DENTAL SURGERY, CINCINNATI.

I SHALL premise this article by adverting to the Interglobular Spaces. In the first place, there are no such spaces to be found in sound dentine. The appearances that have given rise to such suppositions are delusive. They are in all cases defects in the mounting, so far as my own observations are concerned. By applying heat from a spirit lamp, these spaces may be caused to assume varied shapes, and even disappear altogether. Here I shall leave the subject.

The blood-vessels in the pulp ramify extensively through and among the nerves, furnishing nutrition to the entire tooth, as all nutrition ceases when that nerve is destroyed. These blood-vessels anastomose extensively with each other, and contain red and colorless globulin, together with all the other constituents of blood.

There are capillaries that do not carry red blood passing through the pulp membrane, stopping there with open mouths, which furnishes a nutritive fluid to the spaces between the two membranes, consisting of albumen, serum, colorless disks, and the earthy salts. In a state of health, no red blood is found in these spaces, only in cases of inflammation, when the capillaries become sufficiently large to let red globules through. On opening a nerve cavity containing a normal nerve, there will be found a limpid fluid only. This fluid furnishes all the nutritive materials for the tubuli which is taken in by osmotic action, there being sufficient space

for that purpose surrounding each nerve filament. These filaments have a thin covering or neurilemma; this, however, is not demonstrated, only it is in accordance with the nervous system in general. This covering must be sufficiently porous for purposes of absorbing nutrition and giving off effete matter; so also with the intertubular walls. This absorption or osmotic action is carried through the tubuli to the enamel or to the interenamel membrane and to the crusta petrosa, and through the latter to the outer surface or near the pericemental membrane, where it meets the nutrition from that membrane (this is simply a hypothesis, though tenable).

Ossification of the nerve has been spoken of but not fully described. This process will be noticed under two distinct heads.

First, from wearing away or down of the crown until within a certain distance of the cavity, this distance varying in different cases. As the crown is worn away, the prominences are the first worn; generally before all the enamel is worn away from the crown, the process of ossification begins, first under the points most worn, which is the cornu or horn, corresponding to the cusp, then extending across under the wearing surface. When the wearing ceases from any cause, the ossifying ceases until the wearing process is resumed. When this process is not too rapid, there is no uneasiness felt, but when too rapid, the tooth becomes quick or tender on the wearing surface, preventing the person from chewing without pain or uneasiness. The remedy is simple and effectual, that is—rest for a few days. When this wearing process is too rapid, loss or death of nerve is inevitably the result.

This process of silting may go on through the entire pulp canal, if not too much hurried. This process is carried on by a deposit of soluble bony material between the two membranes, caused by an increased flow of blood to the tooth, resulting from the irritation caused by the wearing and wounding of tubuli. At first this bony deposit is in a fluid state, but soon becomes hardened by absorption around the nerve filaments. This process may commence between the dentine and the dura mater dentalis, forcing that membrane downward, causing the pulp to absorb at that point. This point is not fully determined, and needs further investigation. As the nerve ossifies, the nerve filaments are surrounded by soluble dentine, or as one writer calls it, secondary dentine, and very appropriately, too. When a tooth is extracted that has undergone this process in a normal manner, it does not separate from the original dentine, if at all, only on one side, owing, no doubt, to shrinkage. When the tooth is examined soon after extraction, there is no appearance of shrinkage; this only takes place after some days. This substance has about the appearance, to the naked eye, of cementum. This process or formation might with propriety be denominated exodontosis internus, and would come under a mixed head, both of physiology and pathology, or either. It is both normal and abnormal; it is, to say the least, an accidental occurrence, not belonging to the original type of the tooth.

There is a condition of ossified pulp depending on a totally different cause, that is, from exposed pulp, causing slight but continued and protracted grumbling or toothache, and when not too sudden, in certain temperaments, results in ossification of the entire pulp in some cases, in others only partial. The pain or irritation causes an excess of earthy salts to be carried to the pulp, or at all events to be retained there sufficient to ossify the pulp, more or less throughout. In some instances circumscribed points only are ossified, sometimes a fang only.

The ossified pulp under consideration has no adhesion to the dentine, only occupying the exact space of the normal pulp, there being a perceptible space between this and the dentine, which may be distinctly seen with the natural eye or a low magnifier. This form of abnormal nerve shows the filamental system more perfectly than any other prepared nerve for the microscope. Sometimes the petrifying process, if I may be allowed the expression, commences most actively immediately under the seat of decay. This is, no doubt, frequently the cause why we are not able to stop toothache by application of arsenic, the nerve having but little vitality and being so much hardened as to prevent any absorption of the arsenic, and if absorbed, absorption could only take place outside of the pulp. I have noticed the normal amount of fluid outside of pulp frequently after extraction. There is generally some sensibility on introducing an excavator or on pressure. This comes under the head of pathology, and is not a natural, but a saving provision in nature, and sometimes the tooth is saved from this cause where it otherwise might have been lost. In such cases the dentist would have rather a difficult task before him to extract such a nerve. Similar processes may occur sometimes under the filling of a tooth where there has been much sensibility. I have a tooth of that sort in my possession, where a pure silver amalgam plug had been in some seven or eight years, the tooth having grumbled about seven months before extraction. The query is, at what time did ossification take place in this instance? It was a large cavity, and the plug, tooth, and pulp were all dark colored, nearly black.

(To be continued.)

THE BEST MATERIAL FOR "ROOT FILLING."

BY E. PALMER, LA CROSSE, WIS.

A WRITER, under the head of "Root Filling," in the November number of the DENTAL COSMOS (1867), gives his favorite plan in favor of Hill's stopping. I shall differ with him in its application, but not as to its value as an assistant in treating nerve canals. Not being fortunate enough to practice where a majority were able to compensate or willing to submit to the free use of gold for all purposes, a series of experiments in the use of *cheaper* materials has led me to adopt the following plan in the treatment of pulp cavities.

I enlarge well the mouth of the canal, and as deep as the case will admit—not only that I may plug with ease, but that I may succeed in removing *all* decomposed matter. With the cavity prepared, I fit to it a cone of soft, flexible wood that will pass easily into it; the point of this I bifurcate and arm with what cotton the case will admit saturated with iodine in creasote. With the cavity well protected and dried, I cover the plug thus prepared (except the point) with a paste of Hill's stopping, leaving only surplus to press into every place not filled by the wood cone. I have saved more teeth and in better condition by this method during the last five years than with the use of gold, yet I do not discard gold altogether for this purpose. I believe in a discriminate use of creasote, and would not think of plugging a nerve canal without leaving more than "a smell of it" in the cavity, and have not attributed any failure I may have had to a too free use of it.

PROCEEDINGS OF DENTAL SOCIETIES.

DISCUSSIONS OF THE SOCIETY OF DENTAL SURGEONS OF THE CITY OF NEW YORK.

BY J. S. LATIMER, D.D.S.

At the meeting held February 27th, the Society passed resolutions deprecatory of the action of the Boston Dental Vulcanite Company, and repudiating the "arrangement" made by the Committee of the American Dental Association at its Boston meeting.

A. P. Merrill, D.D.S., read a paper on Filling Pulp Cavities, of which the following is a brief abstract:

This operation should be performed in the most thorough manner. It is an open question among operators whether it is necessary to fill the roots of teeth at all, or not, and there is quite a diversity with respect to the materials best suited to the operation when it is performed. He believed the roots should be filled when possible, but the materials should be chosen to suit the particular case. Prefers soft foil for filling the canals when gold can be well introduced. Generally waits four or five days after the application of the arsenious acid before removing the pulp. Small pliers and broaches suffice to detach the pulp after good access is obtained. After subsidence of bleeding, should there be any, he wipes out the canals with cotton on a broach; then, again, with cotton and creasote, and next fills the entire canal with very narrow strips of foil, as far toward the apex and as densely as possible. If he filled the canal at its apex with cotton, he would fill the entire canal with the same material, deeming it bad practice to unite the two in one filling.

If the canal is to be filled with cotton, he makes a small dense rope, packs it into the canal with delicate pluggers, and condenses as thor-

oughly as possible. Cotton has the advantage of being readily introduced into even very delicate canals, besides making a comparatively good and cheap stopping.

The question being, "Do you fill the Roots of Teeth? Why? How? With what?" J. S. Latimer said, he filled the roots when he could do so, because he believed the unfilled canal liable to become occupied with pus or other fluid, which, by its decomposition, produces a gas that, by pneumatic pressure, causes irritation and inflammation.

He did not know that he had anything peculiar about his method of filling roots. He long since abandoned enlarging the canals, because he had been so unfortunate as to get through the root and into the alveolus in attempting it on curved roots. When the pulp cannot be removed from a canal, as is sometimes the case, he does not attempt to fill that root, but contents himself with the application of creasote and tannin, and the hope that the remaining pulp may become either healthy or indestructible. He saw no objection to the combination of several substances in one canal, if those substances were incapable of decomposition in the root and made an impervious stopping; frequently fills the entire root with gold; often puts a little cotton with creasote in the apex, and completes with gold; sometimes fills the entire canal with cotton, and occasionally employs gutta-percha. In some cases great care in carrying the first portions of any kind of material up to the apex should be exercised, because of the irritation produced by the pneumatic pressure consequent on the piston-like action. This condition forbids the use of Hill's stopping at the commencement; but this material answers excellently later in the operation. After thoroughly drying the canal, in these irritable cases, he carries a few fibres of dry cotton on a fine, smooth broach, very slowly up, giving time for the air to escape between the fibres. This being well condensed, a second portion may be carried upward and packed in a like manner, and then a third, but this may be saturated with creasote. The apex thus sealed, the balance of the canal may be filled with any convenient and impervious substance. To carry foil into canals, he rolls triangular pieces upon fine broaches, carries them well into the canal, withdraws the broaches, and packs with a delicate plugger each portion thoroughly before adding another.

But many canals he is unable to fill with anything, and some he could not so much as *find.*

B. W. Franklin was glad to hear an honest confession of failures, which we all knew were occasionally unavoidable. He then exhibited some teeth which he had brought for the purpose of showing the class of roots which it is now impossible for us to fill thoroughly.

G. A. Mills said he succeeded in filling to the apices of the roots in half or two-thirds of the cases. He did not know absolutely whether it is essential that roots be filled, but in our present state of knowledge on this subject, he felt safer when he succeeded in filling thoroughly; re-

commended speaking to the patient of the fact, when cotton is used in the roots, as otherwise he may get the idea that a cheap material was used in the teeth from represensible motives, should he subsequently have the tooth removed by another dentist.

C. E. Latimer, D.D.S., referred to some investigations he had made and published, proving that in the inferior molars of people past the prime of life, a large proportion have three and some have four canals, rendering it exceedingly difficult, if not impossible, to thoroughly fill them; feared to leave canals unfilled lest they be occupied with fluids which may decompose and make trouble; fills small, tortuous canals with broaches wound with foil, and thinks he succeeds better thus than he could by any other method with which he is acquainted.

C. P. Fitch fills roots when practicable, yet he is convinced that the thorough extirpation of the pulp is of greater consequence than root-filling.

March 13th.

The Society elected the following officers:

President.—C. A. Marvin, D.D.S.

1*st Vice-President.*—G. F. Schaffer.

2*d Vice-President.*—J. C. Robbins.

Recording Secretary.—C. E. Latimer.

Treasurer.—C. D. Allen, D.D.S.

Librarian.—J. S. Latimer.

Corresponding Secretary.—J. C. Sproull, of 31 Bible House.

March 22d.

The same subject being continued, Dr. Varney read the following paper:

For convenience of description, I will divide the pulp cavities of teeth having more than one root, into *pulp chamber* and *canals.* For the other teeth, no such distinction is necessary.

First as to "*why?*" In view of the fact that only a few of the canals claimed to be filled are really treated as represented, and that many of those so indifferently done give little or no trouble, as an immediate sequence of such treatment, it is difficult giving a conclusive answer to the question why pulp canals should be filled.

To bring you to a realizing sense of the fact that pulp canals are not *always* filled to their foramina, I need only call back to your minds the last half dozen pulpless molars disposed of in your practice. Especially is it difficult to fill the posterior buccal roots of superior molars and the anterior roots of inferior molars.

That these canals are not often well filled will be generally conceded. I do not wish to be understood, however, as implying that trouble is inevitable, or even a necessary consequent of such imperfect treatment; in-

deed, I believe if it were possible to remove the pulps perfectly in every case, the necessity for filling the canals would not exist.

"*When?*" The canals may be filled immediately after the removal of the pulps, if recently devitalized, and no periodontitis is present. But in cases presenting with pulps already dead and suppurating, prudence would counsel a delay of several days after a thorough cleansing of the pulp cavity and canals, even though no evidence of periodontal inflammation appears. One or two applications of creasote in the roots, loosely covered with cotton to prevent the escape of gas resulting from decomposing pus, is preferable to filling the cavity with gutta-percha or wax. If an abscess is present at the extremities of the roots, the canals may be filled immediately upon the establishment of a conduit for the escape of the pus—either by nature or your own hand—and the subsidence of periodontitis. Care should be exercised to keep the fistula open until the cavity made by the abscess is filled with new growth, especially in scrofulous or cachectic cases.

"*How?*" Direct access must first be had to every part of the pulp chamber, and through it to the canals before they can be filled with any degree of certainty. In molars and bicuspids the grinding surfaces must be well cut away; canines and incisors may be opened through their lingual surfaces, except when the cavity of decay affords good access to the canal. Do not waste time in enlarging the canals much. All being now ready, carry the gold, silk, or cotton—as you prefer—wet with creasote, as near the foraminal extremity of the canal as possible, and then proceed as in a simple cavity. That contradiction may not appear to exist in what I have said, I take occasion to remark that my only reason for wishing the creasote as near the extremity of the canal as it can be carried is that it may preserve or render inert any small portion of pulp that may not have been removed.

C. E. Latimer read a paper on "Inferior Molar Pulps."

W. H. Atkinson, M.D., said he did not often fill roots, preferring to save the pulps alive. He thought it preferable to fill roots rather than leave them empty, for the reason that it is thus rendered absolutely certain that fluids cannot enter. If the foramina are perfectly sealed, he cares little what the material in the balance of the canals. In case of periodontitis having no outlet through the gum, he preferred not to fill at once, but if compelled to do so, would make a way of escape for the pus and gases with the lancet, and would then dress with calendula.

Professor J. Taft, by invitation, made some remarks, in which he admitted that he was undecided as to whether it is always better to fill roots. Many remove the pulps and leave the canals open. He generally fills the roots, perhaps from force of habit. If the foramen is closed, he thinks it matters little about the balance of the canal. He does not devitalize the pulp before removing, but extirpates at once, and fills as soon as the bleeding subsides. He does not always wait for the cure of perio-

dontitis before filling. Some years ago Dr. Atkinson removed the sack through the palatal root of one of his superior molars, cleansed the canals, dressed with creasote, and then filled roots and crown with gold. The first few strokes of the mallet gave pain, but in half an hour the pain subsided, and has never returned. If the patient was in good general health, he would fill such a tooth at once, otherwise not; fills the apex of the root with creasote and cotton; had seen cases in which gold had been driven through the apex. Each case must be treated according to its peculiarities. When asked why he preferred to saturate the cotton in the apices with creasote, he replied that the pulp, if any portion still remain, was converted into carbolate, and he had found that the economy tolerated its presence.

C. P. Fitch, M.D., said some patients who present for the treatment of diseased teeth are so constituted that pus is formed on the slightest provocation, and until we recognize this fact and the signs of the condition, we shall be frequently unsuccessful. Recognizing the condition, he would first treat constitutionally; does not often remove pulps without previously devitalizing with arsenious acid, but sometimes does so with very little pain. With reference to filling roots, he said that if we could close the foramen, we need not trouble ourselves about the rest. After filling the apex with cotton and creasote, he fills the balance of the canal with cotton and sandarach.

Wm. H. Allen fills roots with gold, and with cotton saturated with creasote, *when he can;* but he often finds himself unable to fill well with *any* material. Very small canals which he fails to fill give him no more trouble than those that are filled. From very delicate and tortuous canals, he is frequently unable to remove the pulp; and in such cases he does not attempt to fill them.

A. L. Northrop, D.D.S., said he had succeeded in curing the case of epulis of which he had spoken at a former meeting. He extirpated the morbid growth with the actual cautery, then dressed with iodine and creasote, followed by milder applications, such as wine of opium, etc.

George F. Schaffer was glad to hear gentlemen speak of the difficulties they encountered and of their failures. He often found himself unable to remove all of a dental pulp, and feared he often failed to fill to the apices of roots; but he was comforted by the admissions of men of acknowledged skill and integrity who had spoken this evening.

LAKE ERIE DENTAL ASSOCIATION.

THE following synopsis of the proceedings of this Association is condensed from the report of the *Republican:*

The annual meeting of the Lake Erie Dental Association was held in Westfield, N. Y., commencing on the 24th of September. There was

present a large delegation of dentists from the States of New York, Pennsylvania, and Ohio, among whom were several eminent members of the profession.

The President being absent, Dr. A. B. Robbins called the meeting to order.

The first subject taken up was that of Mechanical Dentistry, which provoked a very general and animated discussion. The almost universal custom of making air-chambers in plates found zealous advocates and earnest opponents; the chief argument of the former being that by the use of the air-chamber more immediate satisfaction was given to the patients, encouraging them to persevere in the difficult task of learning to wear artificial teeth. The latter contended that plates without chambers would finally fit better and cause less injury to the mouth than plates with chambers. Many facts of interest to the profession were elicited by the discussion, but the one most concerning the public was that artificial teeth should never, under any circumstances, be worn at night, and for this reason: it is a physiological fact that bone, in a normal condition, is constantly undergoing a process of removal and replacement of particles, and that continuous pressure prevents the complete restoration of the parts, causing what is commonly called absorption. The osseous structure of the mouth is protected only by a thin covering of muscular tissue and mucous membrane, on the firmness and elasticity of which it depends for protection against the pressure of the plate; but when constantly excluded from the atmosphere, especially by hard rubber, which being a poor conductor of heat, keeps the part covered at nearly an equable temperature, these tissues lose their elasticity and become spongy and fungoid. Two very undesirable results are thus arrived at. The mouth is reduced to an abnormal condition, and the plate no longer fits well, which is just what the patient has been trying to avoid by wearing his plate at night.

The Association strongly condemned the practice so common, especially among uneducated dentists, of manufacturing dentists to order in the short time of two or three months, and then turning them out to prey like hyenas on the credulous public. The general opinion was that every student should pass three years of pupilage, including two courses of college lectures, and should not attempt to practice until he can show a diploma.

An election of officers for the ensusing year resulted in the choice of the following gentlemen:

President.—Dr. A. B. Robbins, Meadville, Pa.

Vice-President.—Dr. E. W. Magill, Erie, Pa.

Secretary.—Dr. B. Rathburn, Fredonia, N. Y.

Treasurer.—Dr. M. Chapin, Erie, Pa.

Committee of Arrangements.—Drs. G. B. McDonald, Girard, Pa.; H. Y. Pickering, Erie, Pa.; and J. C. Gifford, Westfield.

Discussions were then resumed. "The Development of Children's Teeth" being the subject first in order, several members participated in the debate, many of whom had given much attention and study to the subject. The substance of the discussion was as follows: In this country the teeth of the majority of the people are not so well developed as is the case in many foreign countries; the principal cause being the nature of the food given to mothers and children. Our mode of preparing and cooking it deprives it of its bone and tooth-making constituents; *e.g.* the fine, white wheaten flour almost universally used in this country is almost destitute of bone-making material, the phosphate of lime being deposited principally in the husks or bran which is so carefully sifted out.

A member related a case in point. A child was indulged in a fancy for living on crackers and water, which contained little or no phosphate of lime. At the age of five years no teeth had been developed. The attention of a physician was called to the fact. He ordered a change of diet, and the result was a set of teeth.

The formation of the teeth begins *in utero*, and unless the mother supplies the proper bone nourishment through the food, the fœtus will take from bone material of the mother, and thereby weaken her structure.

The prevention of disease and decay of teeth has of late years received increased attention from dentists and physicians. Prof. Taft, of Cincinnati, said we were apt to pay too much attention to curing, and not enough to preventing disease. Very much can be done toward preserving the teeth after they have been filled, by attending to the general health of the system—an intimate relation existing between all parts of the organism. We all know the advantage of keeping the teeth clean, but the *use* of the teeth is an important matter not generally understood. Every organ has its use and should be used, or it will not be properly developed. The child should be obliged to eat food which requires considerable mastication, otherwise its teeth will not be firm and resisting, and will decay. Dentists have naturally paid more attention to the subject than physicians, and their interest in it is increasing. They hope to see the time when a set of artificial teeth will be a rarity, only resorted to in cases of absolute necessity, as are artificial limbs.

The following resolution was unanimously adopted:

Resolved, That whatever may be chargeable to climatic causes or the exhibition of medicines in remedial treatment, the general defect in American teeth is largely chargeable to errors in diet, and that we recommend to heads of families a return to simpler habits, the use of coarser bread for children, plenty of pure air and exercise. That our thanks are due to those members of the medical profession who recognize the possible advantage of efforts to aid nature in building up dense structures, by furnishing the required constituents for bones and teeth, and that we pledge our concert and aid in this direction, hoping that the result of our labors, if not immediately apparent, will develop for the benefit of those who come after us.

In the afternoon, Dr. Magill read a well-written essay in illustration of the foregoing subject.

An essay, entitled "Dental Hints," was next read by Dr. Robbins.

In the evening, Prof. J. Taft, of the Ohio Dental College, addressed a large and attentive audience of ladies and gentlemen.

After the lecture, the following resolutions were passed:

Resolved, that each member of this Association is hereby requested to keep a record of important facts in his professional experience, and especially of the class of teeth extracted, the reasons for extraction, the age and sex of patients for whom extracted, and be prepared to report at each regular meeting of this Association.

Resolved, That this Association appoint a committee of three to obtain a copy of the petition presented to the Ohio Legislature for the suppression of Dental Quackery, and co-operate with similar committees of other local societies in New York, Pennsylvania, and Ohio, to secure the passage of such a law in each of these States.

Drs. Whitney, Wallace, and Chapin were appointed such a committee.

ODONTOGRAPHIC SOCIETY OF PENNSYLVANIA.

A MEETING of the Odontographic Society of Pennsylvania was held at the Philadelphia Dental College on Monday evening, October 7, 1867. Dr. W. C. Head, President, in the chair.

An oral communication was made by Prof. McQuillen on the following subject: "Are the Dentinal Fibrils True Nerve Fibres?" (See page 225.) His remarks were illustrated by a fresh calf's head, from which the incisors were removed, and then divided longitudinally so as to expose the dental pulp. Sections of human dentine with the dentinal fibrils projecting from the tubuli, and from the dental pulp, were shown by one of Dr. Lionel T. Beale's horizontal microscopes for class demonstration.

WESTERN NEW YORK DENTAL ASSOCIATION.

BY W. C. BARRETT.

THE Western New York Dental Association held its fifth annual meeting in the City of Lockport, commencing Tuesday, October 1, 1867.

L. J. Walter, of Lockport, was elected President for the ensuing year. A. P. Southwick, of Buffalo, Vice-President; J. Regna, of Rochester, Treasurer, and W. C. Barrett, of Warsaw, Secretary.

Essays were read by A. P. Southwick, G. C. Daboll, W. C. Barrett, B. W. Crok, and Frank French.

B. T. Whitney, A. P. Southwick, and L. W. Bristol were appointed a committee to agitate the subject of protective legislation.

The interest of the session was much enhanced by remarks from Prof. Taft, of the Ohio College of Dental Surgery.

Next semi-annual meeting to be held at Buffalo, first Tuesday in May, 1868.

EAST TENNESSEE DENTAL ASSOCIATION.

BY DR. JAMES CARSON, NEW MARKET, E. TENN.

THE East Tennessee Dental Association held its second meeting in Knoxville on the 17th and 18th of October, 1867, and organized by electing Dr. Fouche, President; James Carson, M.D., Vice-President; Dr. Wm. H. Cooke, Recording Secretary and Treasurer; Dr. Smith, Corresponding Secretary.

A constitution and by-laws were adopted, and a bill of charges agreed upon. Nine members signed the constitution and laws.

The annual meetings will be held on the third Wednesday in every year; the other meetings will be held on the third Wednesday in March and June respectively. The annual meeting will be held in Knoxville, the other meetings at points above and below alternately. The meeting in next March will be held at Cleveland, Tenn., and that in June, at Morristown, Tenn.

THE WESTERN DENTISTS.

AT a meeting of the dentists of the West, held in the Lecture Room of the Ohio Dental College, November 7, 1867, to take into consideration what further defense to make against the demands of the "Goodyear Dental Vulcanite Company," Dr. James Taylor was called to the chair, and Dr. W. P. Horton appointed Secretary.

Col. S. S. Fisher, attorney for the dentists, made a verbal report. At the conclusion of Col. Fisher's report, remarks were made by most present upon the general subject.

On motion of Dr. Cushing, a committee of three was appointed by the chair, consisting of Drs. Geo. H. Cushing, J. Taft, and A. A. Blount, to present a resolution expressive of the sense of the meeting upon this subject.

The committee, after consultation, reported the following:

Resolved, That we approve of the course pursued by the Executive Committee and attorney, who have been acting for the dental profession of the West in contesting the claims of the "Goodyear Dental Vulcanite Company" against the profession; and that we request them to continue the defense to an ultimatum, believing that notwithstanding the decision of Judge Nelson, in New York, the importance of the subject demands a full and final investigation by the highest tribunal in the country.

(Signed) GEO. H. CUSHING, J. TAFT, A. A. BLOUNT, } *Committee.*

On motion, the report of the committee was unanimously accepted and adopted.

On motion, adjourned *sine die*.

W. P. HORTON, *Secretary.* JAMES TAYLOR, *Chairman.*

WEST JERSEY DENTAL ASSOCIATION.

At a meeting of dentists, held Nov. 11th, at Trenton, N. J., a society was organized for the advancement of the profession, under the title of the West Jersey Dental Association. The following were elected officers for the ensuing year: Dr. Geo. C. Brown, of Mount Holly, President; Dr. Lewis E. Reading, of Trenton, Vice-President; Dr. John B. Wood, of Camden, Secretary; Dr. Thos. S. Stevens, of Trenton, Treasurer.

Adjourned to meet at Camden, the second Monday of February next, at 2 P.M.

J. B. Wood, *Secretary.*

EDITORIAL.

PUBLISHER'S NOTICE.

This number completes the Ninth Volume of the Dental Cosmos. Its publication was commenced in August, 1859, and subsequent volumes have dated from that month. For many reasons, however, it seemed desirable to change the time of publication so as to make its future issue date from January of each year.

In order to accomplish this object we issued the short volume of five numbers, which is now completed. The first number of the Tenth Volume will be issued January 1st, in new type, and otherwise improved in appearance, and we hope in interest and value.

We send bills to those whose subscriptions have expired, with the request that those who contemplate renewing them will do so at an early date, in order that we may determine the number of copies to print, and that those who desire may be certain of securing complete files of the journal.

CORRESPONDENCE.

POLISHING INSTRUMENTS.

Philadelphia, October, 1867.

Mr. Editor,—In the Dental Cosmos for October there is an article on "Polishing Instruments," by Dr. M. L. Pierce, of St. Paul, Minn., which I think is calculated to mislead those who may wish to alter and *repolish* an instrument, or at least to put them to an unnecessary amount of labor and trouble.

In the first place, he says his former practice was to polish with hardened steel and oil, or soap and water. Now that process is *burnishing,* quite a distinct operation from polishing.

He recommends a soft-wood stick, dipped in soap and water, and then in rotten-stone, and the instrument rubbed until all blackness caused by heating it is removed. Then he says, take another stick, similar to the first, dip it into soap and water, and then in jeweler's rouge, and rub the instrument *until* the polish is satisfactory,—there's the rub.

Now, of all the different materials used for polishing steel, the two used by the doctor are of the least value (in fact seldom or never used) for that purpose, being entirely too slow in their operation. They work well enough on the softer and denser metals.

I frequently receive letters from dentists asking for information on the subject of polishing; and, as there are a great number who reside at long distances from the instrument-makers, often requiring some job to be repolished, I thought a few directions might be of use.

In the first place, after annealing the instrument, and filing it to the required form (which should be done with as smooth a file as can be obtained), it is then ready to reharden and temper.

Next, make three pieces of wood about eight inches long, half an inch wide, and three-eighths of an inch thick, or any other size suitable to the taste of the operator. Then take three strips of clean leather—new sole leather is much the best for this purpose—and glue them firmly to the half-inch side of the sticks. When dry, trim the leather with a knife or file to make a flat surface and square edges. This being done, take one of them and coat the leather with glue—not too thick—and dip it into emery spread on a piece of paper, pressing it firmly to imbed the emery in the glue. Emery of No. 90 size, which is a few sizes coarser than the flour, is the best. Having done this, put it aside to dry. Proceed in the same way with stick number two, only using flour of emery instead of the coarse. The remaining stick must be covered with crocus (sesquioxide of iron), put on with a little water in the form of paste; it can be spread on with the finger or a knife; no glue is required for this purpose.

Having the instrument now ready to polish, take the coarse emery stick to remove the file-marks, which it will do very readily with a little rubbing. This being done, take the fine emery stick and cover it with cake emery, or flour of emery and oil; rub until the marks left by the first process are obliterated. Next wipe the instrument quite free from grease, then polish with the crocus, which can be used dry. The instrument will then have the appearance of one just from the manufacturer, who uses the same materials, only on wheels instead of sticks. The operation on one instrument need not occupy more than five minutes at the utmost.

If the instrument to be polished is soft, it may be burnished with soap and water and a hardened steel burnisher, which will take less time than finishing with crocus; but if hard, the crocus will be found to work more satisfactorily.

When the sticks are once made, they will last for some years: the coarse one will need recoating with emery occasionally; to do which, it is only necessary to give it a *thin* coat of glue, and dip it in the emery as before. The fine one will improve with use.

Care must be taken to keep the crocus free from dirt or *grease* of any kind.

Cake emery may be made by melting three parts of fat with one of beeswax, and adding sufficient flour of emery to make a thin dough, which will become hard enough for use when cold. The fine emery and crocus will be found very useful in keeping burnishers in order. The cost of the sticks and sufficient polishing materials to last a lifetime, will not exceed one dollar.

A stick similar to the others used with oil and rotten-stone will be very useful in polishing ivory, bone, or tortoise-shell.

CHAS. A. BLAKE.

BIBLIOGRAPHICAL.

IS IT I? A BOOK FOR EVERY MAN. By Prof. HORATIO ROBINSON STORER, M.D., Vice-President of the American Dental Association. Boston: LEE & SHEPARD, 1867, p. 154.

The author of this ably-written treatise has had the courage to take hold of, and present in a popular and unexceptionable manner a subject of vast interest to the well-being of society, but which, singular to say, the medical profession heretofore has left almost entirely in the hands of unprincipled men, who, as charlatans of the deepest dye, have put forth the grossest productions that could possibly emanate from the human mind; and while aiming to secure their own ends by advertising themselves and their nostrums, have pandered to the depraved imagination of the most debased sensualists.

Embracing the consideration of the true relation of the sexes; the abuse which the procreative organs are subjected to, and the physical, mental, and moral degradation and misery resulting therefrom, the author deals with subjects that interest every one, the young and the old, the single and the married, the parent and the childless. The objection which might be urged against the presentation of such subjects to the public, the author anticipates as follows:

"Is it asked, if the disclosures that I shall make are not by their very publication subversive of good morals, and the calling attention to the true relation of the sexes suggestive to bad men of, and conducive towards, their false relations? I answer:

"To ignore the existence of sin, error, misery, is in reality to encourage and increase them. It is like walking upon thinly-crusted lava, or breaking ice, certain to prevent our saving others, ready indeed to engulf ourselves. We varnish over or seek to conceal vice, and it loses half its grossness; it becomes attractive perhaps, or fashionable; but if we strip it of its veil, any soul not wholly smurched, will recoil with horror."

Writing upon a delicate subject in a style which the most refined mind cannot take exception to, the author has prepared, as he justly names it, "A Book for Every Man." J. H. McQ.

PERISCOPE OF MEDICAL AND GENERAL SCIENCE IN THEIR RELATIONS TO DENTISTRY.

BY GEO. J. ZIEGLER, M.D.

On Light in its Vital Relations. By GEO. J. ZIEGLER, M.D.—"Light is a very important condition of life, though apparently not so essential thereto as heat. Nevertheless, its influence is very potential in promoting life action; and besides, as it is analogous to, and correlative with heat, it is hence more or less necessary to the existence and development of the vital economy. The influence of light has, however, been considered too exclusively limited to the lower forms of life, the vegetable especially, while in reality it is highly essential to the existence and development of animal as well as of vegetable life. Its influence is, therefore, not limited to plants alone, but extends also to animals, man inclusive. This influence is especially exerted in promoting the organic or vegetative processes, and is thus strikingly manifested in the growth and development of both plants and animals. Its power in thus promoting the vegetative functions of both plants and animals is very great, and often strongly marked.

"Still, this power is not exclusively limited to the promotion of the organic functions, or the vegetal life of animals alone, but is also more or less active in promoting those of the animal life, or the life of relation. This is constantly exhibited in the influence which it exerts in augmenting the sensibility, impressibility, and irritability of the special senses and general nervous system, and increasing the excitability and activity of the muscular organs. The influence of light upon the animal economy does not, however, stop here, as it is, moreover, still further operative in exciting the functions of the cerebrum, and is thus active in promoting the higher and more exalted processes of psychical life. While, therefore, light is very active in promoting the functions of organic or vegetal life, it also exerts more or less power over those of both the animal and psychical life.

"That light does thus exert a powerful influence over the various functions of the animal economy may be made more clearly manifest by a more particular notice of some of the phenomena to which it gives rise. Thus, for instance, it enables the organic or vegetal life to exert sufficient chemical power to convert inorganic matter into organic compounds for organic purposes. Plants are thus enabled to take up, decompose, recombine, and finally appropriate various simple and compound substances, both inorganic and organic. Light is hence especially useful in causing the plant to decompose carbonic acid, water, and ammonia, and to rearrange their constituent elements, or combine their components in such manner as to form other and more complex bodies. In this way the plant is enabled to generate organic compounds out of simple or complex substances, and thus to prepare and supply the necessary pabulum for the more immediate as well as ultimate purposes of life.

"This chemical influence of light appears to be more energetically exerted on plants than on animals, because, in the first place, they are the more immediate agents for the preparation of organic matter out of the crude elements; and, in the second place, the material employed for ali-

mentary purposes by the latter is usually in a state more nearly approximate to that of their own structure. Though correct in the main, this is not, however, absolutely the case in all instances, as much matter, both simple and compound, inorganic and of a low grade of organization, is introduced, combined, and transformed within the animal economy, prior to its more specific and ultimate metamorphosis and final assimilation. But besides these preliminary changes incidental to the construction of the organic pabulum for nutritive purposes, active chemical metamorphosis takes place in the retrogressive processes, for the perfection of which it is more than probable that light is highly essential.

"The influence of light is, however, not only operative in thus modifying matter, but it is also active in promoting the development of living forms, both vegetable and animal. This is apparent to common observation, though it has also been demonstrated experimentally. Thus, for instance, it is strikingly exhibited in the rapid growth and extreme development of the flora and fauna of the tropics (where light is most intense and abundant), and the relative difference between them and those of the arctic regions, though of course this effect is due, in some measure, to the conjoint influence of heat. It is also exhibited in the relative influence of day and night, light and darkness, upon the growth and development of both plants and animals. Moreover, it is still further shown in the partial or complete suspension of organic metamorphosis and development by the more permanent privation of light, a striking illustration of the truth of which is presented in the experiments of Dr. Edwards, in which tadpoles were prevented from undergoing their usual development into frogs by being secluded from the light. Experiment, then, as well as observation, teaches that light is essential to the normal development of both vegetables and animals, and this is as true of the human body as of any other living organism.

"The influence of the light in thus promoting chemical metamorphosis and organic development, is hence very extensive and potential. But, as before intimated, this photogenic influence is not exclusively limited to the organic or vegetal life, as it is also more or less active in promoting the functions of the dynamic apparatus, or those of the animal and psychical life; in proof of which it is only necessary to point to the greater restlessness and activity of the body and mind during those periods of time in which the diurnal as well as annual increase of light takes place in the same spot as well as in different parts of the earth; and conversely, to the inactivity, inertia, and even stupor of the diurnal and annual diminution of light, during the night and those long seasons of darkness in the polar regions. Also, to the marked contrast appreciated by all, between the mental exhilaration and cheerfulness induced by clear, bright weather, and the dullness, gloom, and even despondency, produced by dark and cloudy weather.

"Light is, therefore, mainly instrumental in causing chemical combination and decomposition, in generating organic compounds, in promoting nutrition, disintegration, and depuration, and in stimulating the dynamic functions of the brain and nervous system. It is thus seen that the influence of light upon the different parts and processes of the human economy, the organic, animal and psychical life inclusive, is very powerful, and indeed of so much importance as to constitute an essential prerequisite for its normal development and healthy status.

'The sources of light, or rather the more immediate agents for its de-

velopment, are somewhat numerous, though the principal and most important is planetary influence, and the planet thus most active is, beyond all question, the sun. Besides this, there are others connected with both the inorganic and organic world. Thus, for instance, mechanical, chemical, organic, and dynamical action gives rise to the phenomena of light, with different degrees of intensity and quantity proportionate to the activity of the developing cause. Some of these are more or less under artificial control, and the influence of this artificial light is, in some respects, similar to that of the sun. The intensity and quantity of solar light varies according to the period of the day and season of the year in different parts of the earth, and in the same place at different periods of time, though doubtless the general average is always more or less uniform. The extremes are well marked, between the day and night, summer and winter, dry and wet seasons, and between the tropical and arctic regions. The relative effects of these different degrees of light upon the animal economy are usually more or less apparent. Thus in general, as before intimated, the difference and connection between the brightness and activity of the day, and the darkness and inertia of the night, are very striking. Moreover, the difference in the relative activity, vigor and development of life between the summer and winter, and the tropics and polar regions, is also well marked. Within itself, therefore, light is a stimulant, while its absence or darkness exerts a sedative influence. All other things being equal, then, these effects are in relative proportion to the degree of intensity and the quantity of light. The relative influences of these respective conditions of light and darkness are exhibited in both health and disease, and it is with a view to their better appreciation in these relations, in order to thus exhibit more positively their special connection with that particular morbid state known as tuberculosis, that we have offered these preliminary remarks.

"The vital organism not only appropriates, but also develops light as well as heat. This is apparent in the absorption of light, as well as by its positive development in both plants and animals, man inclusive. This manifestation of light may occur in both health and disease, life and death. The evolution of light in man is, however, somewhat rare, and is considered to be almost if not quite always connected with a state of disease, though it would seem that it may also be developed almost at pleasure in a condition of health. Thus it is stated that a stream of light flowing from the body, may be made visible in the dark, by holding the hand near a broad leather belt moving rapidly. It is also asserted that it may be developed by other means. The forms of disease in man in which light becomes manifest are somewhat different, though they are in the main of an adynamic type. Thus it has been observed in cancer and phthisis and some other morbid conditions. It has also been seen in connection with the breath, sweat, and urine.

"The relation of light to life in general, and to the animal organism in particular, is thus seen to be most intimate and important. This relation is, however, more complex than the preceding considerations would lead us to infer, as we have hitherto treated of it as an unit, while in reality it is a compound of different influences. Thus analysis has shown that it is composed of photogenic, calorific, actinic, and colorific rays. The influence of light is therefore multiple instead of simple, although all of these respective and peculiar constituents doubtless act both conjointly and separately. Notwithstanding, however, the apparently com-

pound character of light, it is probable that its constituents are but mere modifications of one and the same principle, arising either *ab origo*, or out of its relations with material substances. It is thus seen that light exerts at least a fourfold influence, and it is therefore probable that this influence varies at different periods according to the relative intensity and proportion of its constituents. The respective influence of these several elements of light is more or less evident, but as we have already partially noticed some of the most active, we shall not again particularly dwell upon them; nor can we go into a minute detail of the others, and hence shall only allude in a very general way to some of their separate and combined effects with a view to their more direct bearing upon the special subject of attention. The powerful influence of the colorific ray in causing the development of color in both plants and animals is well known, and is in fact so familiar that many persons, and females especially, regard light with so much dread that they avoid it so carefully as to often suffer greatly in general health from its privation. It is especially useful in giving color to the blood and other parts of the animal organism.

"The influence of the actinic ray is also very powerful in causing chemical changes both in the inorganic and organic world. It is especially active in promoting the chemical modifications and organic metamorphoses so essential to life action, and hence it is a potential agent in the production of the organic compounds for the development of both plants and animals, as well as active in promoting those changes essential to disintegration and depuration.

"It is thus shown that light is a very potential agent in promoting the various processes of vegetable and animal life, and that it exercises a powerful influence over the functions of the human economy, either organic, chemical, mechanical, or dynamical, and hence necessarily over the vegetal, animal, and psychical life inclusive. This is seen in the potent influence which it exerts in causing the chemical changes essential to the production of the organic compounds for nutritive purposes; in the promotion of the formative and retrogressive metamorphoses; in giving color to the various organic liquids and solids; in aiding depuration; in exciting the senses, and general nervous and muscular system; in stimulating the brain; and in promoting the healthy development, vigor, and activity of the whole organism. While conversely, it is also exhibited in the fact that its absence or darkness retards or entirely suspends development and the various processes of life, and thus diminishes or checks the activity of the organic, chemical, mechanical, and dynamical functions of the animal economy. Proof of this is afforded in the imperfect or non-development of plants and animals, and of man especially; in the impairment of general nutrition, disintegration, and depuration; in the torpidity of the brain and nervous system; and in the consequent inactivity of the body, dullness of the senses, inertia and even gloominess of the mind, with more or less stupidity and disposition to sleep. The stimulant influence of light, and the sedative influence of darkness are in fact so well known as to have given rise to the common practice of excluding the light in the treatment of various forms of disease, those of the brain and nervous system especially, to thus diminish excitement, allay irritation, induce composure and quietude, and promote sleep.*

---

* This knowledge affords a hint which might prove of much practical advantage in the treatment of many diseases, both general and local, in which a stimulant

"Sufficient evidence has thus been presented to prove that light exerts a powerful influence over the vital economy, and that its presence is essential to its perfect development and healthy condition; and moreover, that this is as true of the human as any other organism. While, on the other hand, it has also been shown that its absence is a frequent and potential cause of imperfect or mal-development, inertia, and derangement. These derangements are of divers kinds both physical and psychical, and are frequently exhibited in the form of the various cachexias and their concomitants. An insufficiency of light is therefore an active cause of disease, and more especially of those forms of atrophy and adynamia, connected with anæmia, rickets, scrofulosis, tuberculosis, and similar affections. Its ætiological relation with tuberculosis is well known, though too often overlooked or totally disregarded. Darkness or the privation of light is indeed a potential cause of this disease in both man and the lower animals, and it is necessarily very active in increasing its intensity when it already exists. Hence, all other things being equal, those who are deprived of the vitalizing and beneficent influence of solar light are most frequently and severely affected with phthisis. This is not only true of man, but also of other members of the animal kingdom; hence the prevalence and activity of this disease in rabbits, cats, parrots, pigeons, monkeys, and other animals when obliged to live an artificial life which excludes them from the light. This is exemplified by the frequency and fatality of this affection in convents, prisons, factories, barracks, cellars, menageries, and other dark and often damp places. This vicious system of seclusion from light is, however, not only thus often coercive, and involuntary, but also very frequently resorted to from choice in consequence of erroneous views concerning its influence, or false notions respecting beauty of complexion and delicacy of organization. The voluntary seclusion from light is very general, as is evident from the extreme care taken to exclude it from dwellings, offices, and other places of business, as well as to avoid it in the ordinary pursuits of life; and this too in so-called civilized society, notwithstanding its boasted intelligence and wisdom. This evil with many others just as absurd and injurious prevails very extensively, in cities especially, and hence the greater prevalence of the tuberculous forms of disease and the increased destruction of life in such places. In this connection compare for instance, the fresh and ruddy hue, florid complexion, or swarthy appearance and vigorous condition of those who, like farmers, sailors, and the various races of men, are freely exposed to the sunshine, with the pale and etiolated aspect, anæmic condition, and adynamic state of those who are more or less habitually deprived of the light. To obviate and correct as far as possible, therefore, those evils resulting from a deficiency of light, it will be necessary to abandon the senseless and pernicious custom of excluding it from houses by means of shutters, blinds, curtains, and other appliances, or of otherwise avoiding it, and to adopt instead the more rational and salutary plan of free exposure to it, to thus secure the due proportion and beneficial influence of

---

influence is required. Thus persons with purely adynamic states of the eye, brain, nervous, muscular and general system, as amaurosis, idiocy, dementia, paralysis, anæmia, inanition, and other atonic conditions, might probably be much benefited or even restored to health by a free and prolonged exposure to light. Indeed the practical value of such a course has already been demonstrated to a certain extent. This measure alone or in conjunction with other rational treatment is therefore worthy of a more extended, careful, and systematic trial.

this bountiful source of life. A due exposure to light is especially important to children, to thus insure healthy growth and development, and prevent as far as possible the inception as well as aid in the resolution of the various adynamic and atrophic affections so peculiar and destructive to the young. And besides these, to thus break up in their incipiency those morbid tendencies, which if allowed to develop, so often become active and destroy life at a later period of time.

"It is thus seen on the one hand, that general and local atrophy and adynamia, with anæmia, scrofulosis, tuberculosis, and many other pathological states, are frequent results of an insufficiency of light; and, on the other, that its presence and influence is very powerful in preventing and removing such morbid conditions. Light, therefore, exercises a very beneficial and potential influence, both hygienic and therapeutic, in averting and resolving tuberculosis as well as many other abnormal conditions; and hence those thus threatened or afflicted should be freely exposed to its salutary power. If then this plan of free exposure to solar light was more general, much less disease of all kinds, and particularly of that form known as tuberculosis, would prevail, and more recoveries would take place of those thus afflicted. It would, moreover, not only thus prevent and remove much physical, but also much psychical disorder, as the deficiency or entire absence of light causes, in addition to derangement of the organic life, irregular or defective innervation and cerebration, promotes sadness and misanthropy, encourages anxiety and fear, diminishes moral and intellectual vigor, and thereby increases the tendency to physical and moral degradation. While on the other hand, the presence of light causes physical invigoration and mental activity, and promotes cheerfulness, vivacity, and morality. It then becomes an important duty as it is a necessity of existence, for every human being to secure its due quantum of light, so as to thus not only preserve, but restore when lost, its healthy physical and mental status. In its various physical and psychical relations light is therefore especially necessary to those predisposed to or afflicted with phthisis to thus prevent or resolve this abnormal condition. Its necessity to such is in fact so obvious that it is scarcely necessary to further urge its importance. Suffice it to say then, that the proper exposure to light of tuberculous persons cannot be too strongly enforced, as it is not only an important hygienic measure, but also a powerful therapeutic agent, and an essential prerequisite to the successful treatment of phthisis."—(*Medical and Surgical Reporter*, June 11th, 1859.)

—

"*Effects of Solar Rays upon Animal Tissues.*—A paper by Dr. G. Robinson, on certain effects of the concentrated solar rays upon the tissues of living animals immersed in water, was read to the British Association for the Advancement of Science, by the Secretary, Professor Turner. The author opened by showing that of all fluids water, next to air, is that medium most intimately connected with animal and vegetable life. He had been hence led to examine the effects produced, by concentrating the solar rays on numerous bodies immersed in water, and he believed that sufficient results had now been obtained to justify the prosecution of the subject. His experiments showed that by concentrating the solar rays upon the skin of the hand the same immediate burning pain, followed by inflammation and vesication, was produced as if the part had been

similarly heated in the air.* The subaqueous concentration of the rays on any part of the surface of aquatic animals gave rise to instant pain, and when the focus could be retained for a few seconds on the head of a tadpole or small fish, death immediately resulted as though from an electric shock. That this action was rather physiological than purely physical, the writer endeavored to prove by a variety of considerations. It thus appeared that the nervous structures of living animals are peculiarly sensitive to the stimulating agencies present in the solar rays, irrespective of the actual heat of the latter, and it is thus rendered probable that it was not the calorific element of those rays that produced the effects witnessed in the experiments. Whether or not their actinic or chemical part chiefly operates in these cases, or whether another active power still more nearly allied to electricity, or to the nervous force itself, is really contained in the sun's rays, must be left for future research."—(*Medical Times and Gazette.*)

"*Physiological Action of the Methyl Compounds.*—Read in Section D, British Association. By Dr. B. W. Richardson, F.R.S.

"The author opened by briefly recapitulating the work of the previous reports, and by noting several facts showing in a satisfactory manner the practical good that had followed their publication. Passing to the methyl compounds, the substances now to be considered, he said they were of unusual interest, inasmuch as the poisonous gas known as fire-damp, and the beneficial agent chloroform, were included in the group. He then divided the substances to be described, in regard to their physiological action, into two distinct groups, with their chemical constitutions or characters—giving first in detail a list of the methyl series as follows:

Methylic alcohol.	Bromide of methyl.
Hydride of methyl; marsh gas; fire-damp.	Acetate of methyl.
Chloride of methyl.	Methylic ether.
Iodide of methyl.	Nitrite of methyl.
	Nitrate of methyl.

"The methylene series was given as follows:

Chloroform (Terchloride).	Tetrachloride of carbon.
Bichloride of methyl.	

"Dr. Richardson next discussed the action of the above substances in detail. The following is an abstract of his observations: With regard to alcoholic fluids, he observed that the physiological law was that the period of time required by these bodies to produce their effects, and the period of time required for recovery, turned altogether on the boiling point of the fluid used. This was so certain that when the boiling point of one fluid and its action were known, the action of other fluids might be predicted from their boiling point. The explanation was simple. The alcohols taken into the body did not enter into any combination which changed their composition, but passed out of the body, chemically, as they entered it, and their evolution, and the time of their evolution, was the mere matter of so much expenditure of force, caloric, to raise them and carry them off. He had tested this, and found that intoxicated animals recovered more or less quickly according to the temperature in

---

* Concentrated light has been recently successfully employed as a cauterant and resolvent for the removal of nævi and other affections of the cutaneous surface, *vide* Med. and Surg. Reporter.—Z.

which they were placed—those in the higher degree returning the sooner to their normal condition. The practical lessons were, that in alcoholic poisoning of the human subject the most important condition for recovery was a high temperature; and that as methylic alcohol was more rapid in its action and much less prolonged in its effects than common alcohol, it could be used with great advantage by the physician in all cases where he felt an instant demand for alcohol. All alcoholic bodies are depressants, and although at first, by their calling injuriously into play the natural force, they seem to excite, and are therefore called stimulants, they themselves supply no force at any time, but take up force, by which means they lead to exhaustion and paralysis of power. In other words, the calorific force which should be expended on the nutrition and sensation of the body is expended on alcohol. Dr. Richardson added to his recommendation of methylic alcohol as a medicine the facts that when quite pure it was very palatable, and that it mixed easily with either hot or cold water.

"*The Hydride of Methyl.*—The hydride of methyl occurs naturally in the form of fire-damp in mines, and as marsh gas on land. It is made artificially by heating together in a strong flask acetate of soda, caustic potash, and well dried lime. For physiological experiments the hydride of methyl can only be administered by inhalation. It is a pleasant gas to inhale, producing no irritation, nor yet giving rise to any of those feelings of excitement which are induced by nitrous oxide gas or the vapor of chloroform. It might therefore be ranked, as Mr. Nunneley had long ago ranked it, as an anæsthetic; but as its effect was evanescent, and the quantity of gas required to produce an effect was very great, it was practically valueless for this purpose. Dr. Richardson then proceeded: As this gas is often a cause of death in mines, I thought it was worth inquiry—What percentage of it would prove fatal in the air? I therefore had constructed a glass chamber, through which an atmosphere charged with various quantities of the gas could be passed. To my surprise, I found that even pigeons—animals peculiarly susceptible to the influence of narcotic gases—could live in an air charged with not less than thirty-five per cent. of the gas, for the space of half an hour; while I could myself inhale the air coming from their chamber with the utmost ease. When at last by pushing the gas further, death is induced—it comes as a very gentle sleep, so gentle, indeed, that it is difficult to say when the action, either of the circulation or of the respiration, is over. The lungs are left with the blood in them, the heart has blood on both sides, and the blood itself retains its natural character. The death is by the slow negation of breathing. We may gather from these facts many important lessons in regard to the risks and dangers of miners from fire-damp. I should think it is almost impossible that any body of men, or any men who were awake in a mine, could be so entrapped with fire-damp only as to die in the absence of an explosion. In accidents where this seems to have occurred, I should imagine that with the fire-damp there is also evolved carbonic acid gas. I can, however, imagine after an explosion, when the mine becomes for a moment a great vacuum, that there would be sufficient entrance of the gas to produce a fatal atmosphere. In such case death would be prolonged, but as easy as sleep; two truths, which in cases of accident should inspire thankfulness and hope—thankfulness that those who thus die for us suffer little; hope as to the possibility of rescue, which should not for days be abandoned.

The best direct means of recovery of those under the influence of fire-damp is exposure to heated air, and the administration of warm nourishing drinks, such as milk. Alcoholics do decided harm. From this point the author proceeded with a description of the action of chloride of methyl, the iodide, bromide, and acetate, methylic ether, nitrite of methyl, and the nitrate, over which we must pass to record his more general researches on chloroform and its allies.

"*Methylene Compounds.*—Dr. Richardson spoke at length on these compounds as anæsthetics, describing the nature and action of chloroform, tetrachloride of carbon, and bichloride of methylene (with which he put a pigeon to sleep under a glass shade). He had been led to the conviction that the cause of death from chloroform was in every case due to the arrest of nervous function, and that the idea of any direct action of the agent on the muscular structure of the heart was without foundation. He had conducted eighty-seven experiments specially to determine the direct influence of chloroform on the heart, and found in every case that organ capable of reaction on its exposure to air, while the lungs were always bloodless, white, and collapsed. The best means of restoration in impending death from chloroform was the introduction into the lungs, by artificial respiration, of air heated to 130° Fahrenheit.* For doing so a small pair of handbellows connected with a thin tube of platinum in a coil was found to answer well, as with a spirit-lamp the coil could be almost instantly made hot. It was only necessary to inject the air through one nostril. The tetrachloride of carbon had recently been brought into use as a substitute for chloroform. With regard to it Dr. Richardson said: As this substance is now gaining importance, I have thought it proper to subject it to very careful experiment, and I feel it my duty to state, both on theoretical and practical grounds, that it is far more dangerous than chloroform; and if it were as generally used, it would act fatally in a much larger number of cases. In its action it presents the same four stages as chloroform, but the second stage is more prolonged and intensified. In one animal, a rabbit, tetanic convulsion of an extreme character was presented during this stage. But the worst feature in the administration of this body is the slowness of its elimination—a slowness fully accounted for by the boiling point. Saturating the nervous centres, and expending their force to the fullest, it kills far more quickly and determinately than chloroform, and so completely is motion paralyzed that the muscles scarcely respond to galvanism five minutes after dissolution. In order to make an exact comparison—and it is from this comparison I draw the results arrived at—I placed animals of the same kind, at the same time, at the same temperature, in chambers of the same size, and administered the same doses of chloroform, and of the tetrachloride of carbon. Pigeons and rabbits alike gave evidence of the more severe effects of the latter substance. In this opinion my friend Dr. Sedgwick, who has rendered me valued aid in these inquiries, entirely coincides.

---

* Nitrous oxide is also very efficient as a restorative. It may be administered either in its gaseous state by the lungs or in conjunction with liquids by the alimentary canal. It should be given gradually in moderate quantities, so as not to generate too much carbonic acid. Both it and oxygen are of primary importance in asphyxia. In chemical character and physiological influence they are the direct opposites and natural antidotes to all such poisonous agents and toxical conditions. They should always be employed whenever practicable, as either alone or in combination with heat they will often save life even in apparently hopeless cases.—Z.

"*The Bichloride of Methylene.*—The last compound on our list is of great interest, from the circumstance that it promises to be a new and valuable anæsthetic. In experimenting with chloride of methyl in ether, I was so struck with its good action that I asked Mr. Robbins, the chemist who had prepared the compounds for me, to endeavor to find, from the methyl bodies, a more stable compound having similar physical properties. In a few days he brought me the fluid I now place before the Section, made for him by Dr. Versmann. This fluid is the bichloride of methylene. It is formed by the action of sulphuric acid on zinc in chloroform, and it differs from chloroform in that one atom of chlorine is replaced by an atom of hydrogen. Its boiling point is 88° Fahr., and the odor of its vapor is sweet, and much like that of chloroform. On testing it physiologically, I found it to be a gentle and perfect general anæsthetic. Under its influence animals lapse into the third stage of anæthesia with the slightest exhibition of the stage of excitement. The insensibility is deep and well sustained, and the recovery quiet and good. (Dr. Richardson here showed the experiment already mentioned of putting a pigeon to sleep.) In some experiments, in order to see the extreme effect, I have carried the administration to the extent of arresting the phenomena of life. I have thus learned that respiration and circulation under the last action of this agent cease simultaneously, and that the muscles retain their irritability for even an hour after death. The lungs are left with blood in the respiratory circuit, both sides of the heart are charged with blood, and the blood itself remains unaltered in physical property. Compared with other anæsthetics, the bichloride of methylene appears to me to combine the anæsthetic power of chloroform with the safer properties of ether. It is too early to speak positively on this point, but if the expectation be fulfilled, the perfection of a general anæsthetic will have been obtained for the benefit of the world. And, even should this happy result not be accomplished, the way at least is paved toward the discovery of some intermediate body which shall answer to the required physical demand. In reviewing the facts connected with the physiological action of the methyl series, we gather that, according to their composition, they exert certain definite influences on different parts of the nervous organism. The oxide produces an influence specifically its own, that of slowly paralyzing the motor function without destroying common sensibility. The nitrite and nitrate rapidly paralyze the centres of motion, while the chloride and the iodide, together with the substitution of the chlorine compounds, not only paralyze motion but also destroy sensation. I conclude this report with one other observation. At first sight it may seem that the isolation of the phenomena produced by special agencies, and the discovery of a new anæsthetic, are sufficient characteristics of this research. With every respect, I submit that a broader question is involved. At the meeting at Birmingham I suggested, almost with a feeling of fear, that out of these studies might spring up a fixed principle of therapeutic discovery. Now I have the conscious happiness of knowing that the hypothesis was correct. I feel convinced by this longer experience that by continued labor we shall be able to pronounce the precise physiological meaning and value of all the organic compounds, to extend the knowledge of curative action of these compounds to every condition of disease that is physically remediable, and to bring positive Science of Therapeutics to a position that shall stand out as a leading

fact in the scientific advancement which the British Association so fervently encourages, and which at once solidifies and beautifies the progress of the present age."—(*Chem. News.*)

"*Chemistry of the Nerves and Nervous Centres.*—Some important investigations on this subject have been prosecuted by O. LIEBREICH, in which he shows that neither cerebrin, nor cerebric acid, nor cerithin, nor any of the so-called phosphuretted fats, pre-exist in the brain; but that all these are probably modifications of one substance, which he calls protagon.—(*Sydenham's Soc. Bien. Retros.* 1867, from Kuhne's *Lehrbuch der Phys. Chem.* 1866, p. 341.)

"Prof. Hermann claims to have found protagon also in the blood. It is contained principally, if not exclusively, in the globules, especially the red globules."—(*Med. Press and Circular* and *Amer. Jour. Med. Sci.*)

"*Action of Anæsthetics on the Blood.*—HERMANN, of Berlin (*Reichert and Du Bois Reymond's Archives*, 1, 1866), has been investigating the effect of anæsthetics upon the blood. He finds that chloroform, ether, alcohol, chloro-carbon, amyl, chlorethyl and its chlorine substitutes, ethyl, methyl, and amyl alcohols, nitrous oxide, and olefiant gas, all possess a property hitherto ascribed to ether and chloroform only; they dissolve the blood-corpuscles, leaving behind a colorless viscous granule representing the corpuscle. This is ascribed by Hermann to the action of the anæsthetic upon protagon, which, according to him, forms a considerable portion of the corpuscles (*vide* paragraph blood). Protagon was discovered by Liebreich (*Annales de Chemie et Pharmacie*, No. 134) to exist in nervous tissue in considerable abundance, and Hermann supposes that anæsthesia may be produced by the action of the anæsthetic upon the protagon in the brain. Although the blood-corpuscles are dissolved by an excess of the anæsthetic, such is not the case when it is inhaled, the quantity necessary to produce anæsthesia being too small to dissolve the corpuscles. Of course no definite conclusion as to the mode in which the anæsthetic acts can as yet be arrived at from this interesting research."—(*Jour. Anat. and Phys.* and *Amer. Jour. Med. Sci.*)

"*Deaths from Ethereal Anæsthesia.*—The Medical Society of Lyons have adopted a most useful measure on this subject. Some doubts existing as to the circumstances which attended cases of death after inhalations of ether, a committee was appointed to inquire into the cases, and their report has been inserted in the Lyons Medical Journal. Due weight has been laid on the peculiarities of patients, on their state of health, on the manner in which the ether was administered, the amount used, and the means employed for resuscitation; so that this report contains facts of the highest importance touching the use of ether as an anæsthetic. One of these facts is, however, clear,—viz., that ether, in spite of the strong opinion expressed by the profession in Lyons, lays patients open to some danger, though perhaps the peril is not so great as when chloroform is used."—(*Lancet.*)

Tansy as a Hæmostatic.—"DR. C. P. UHLE (*Med. Reporter*) highly recommends the *tanacetum vulgare* as a remedy in epistaxis. He suffered frequently from this affection while a student, and upon one occasion accidentally plucked a leaf of tansy and applied it to the part. The hæm-

orrhage ceased immediately, and the remedy has never failed since. Subsequently, numerous experiments were made by Dr. Uhle, with entire and gratifying success. In some instances the simple aroma or odor of the plant was sufficient to quell the most active hæmorrhage."—(*E. Med. Jour.*)

Charcoal as a Hæmostatic.—In a communication to the Berks Co. Med. Soc., Dr. W. Murray Weidman, of Reading, offers the following of interest: "Charcoal (pulverized) has been recommended by all writers for the arrest of epistaxis But sometimes, especially in the country, remedies cannot be obtained. But in every house a cork, a teacup, a stick, and a fire can be found. The cork is quickly charred by the fire, easily pulverized in the cup by the stick (a mortar and pestle), and thus one of the most efficient remedies is speedily prepared. A few weeks ago I was called to see a lad of 17, who had already lost twelve ounces of blood, and was still bleeding profusely from the right nostril. I used pressure, both internally and externally, with no avail. I made a cone three inches long of prepared lint, saturated it with liq. ferri subsulph., and pushed it up the nostril as far as possible. This arrested the hæmorrhage for forty-eight hours, when oozing commenced, and sufficient blood was swallowed to produce nausea and vomiting. I was summoned to his bedside, and finding the blood again flowing, resolved to try the charcoal before resorting to the posterior plug. I had the '*cork charcoal*' prepared, and directed it to be snuffed up, and by means of a quill blown into, the nostril. The result was very gratifying. Four repetitions had the desired effect. The hæmorrhage was stopped, and what was equally gratifying, no pain or distress was experienced, as when the anterior or posterior plug is used. The arrest was so speedy and effectual and the remedy so simple, that I feel warranted in recommending it to the profession in general."—(*Ex. from Trans. of Med. Soc. of Pa.*)

Resin as a Styptic.—It is stated (*Richmond Medical Journal*), by a Richmond physician of large experience, that "pulverized resin is the best styptic known. It will succeed when others fail. It is to be used on cotton or lint."

Plugging Posterior Nares to prevent Hæmorrhage in Operations of Mouth, etc.—"M. Verneuil read at the Academy of Medicine last week a paper on the means of diminishing the amount of hæmorrhage which takes place during operations on the face, tongue, jaws, nasal fossæ, etc. The great obstruction and embarrassment such bleeding produces often cause the surgeon to hasten the steps of the operation too much, while the blood may induce suffocative paroxysms of coughing or vomiting, and other derangements of the digestive organs. The prevention of the flow of blood by operating while the patient is in the sitting posture has its inconveniences, for it is fatiguing to the patient and inconvenient to the operator, favors the occurrence of syncope, and prevents the induction of complete anæsthesia. The plan M. Verneuil has found best suited to cope with the difficulty is to plug the posterior nares as a preliminary step, so as to prevent the flow of blood backward, and in the more complicated operations to attack the deeper-seated parts last. He relates five of his cases as examples of the benefit attendant upon the procedure,

and terminates with these conclusions:—1. Hitherto reserved for the arrest of severe hæmorrhage, posterior plugging should be resorted to as a preliminary procedure. 2. It renders signal service in bloody operations practiced on the nose, the interior of the nasal fossæ, the maxillary sinus, the higher parts of the superior maxilla—in all cases, in one word, in which there is danger of blood being introduced into the pharynx. 3. It absolutely prevents this introduction as long as the vault of the palate is not meddled with; and even when it is necesary to interfere with this it should be employed during the first stage of the operation. 4. Complete anæsthesia may be kept up during all the operation. 5. Such anæsthesia is highly favorable to the patient, not only by saving him from the pain, but also because in suppressing the causes of sudden congestion of the face it diminishes the flow of blood from the surface of the wound. 6. Wherever possible the plugging should be performed before the administration of the chloroform, because the co-operation of the patient is useful. 7. Before proceeding to the operation we should assure ourselves that the occlusion of the posterior nares is complete, and as soon as the bleeding ceases from the wound after the operation, the plug should be removed."—(*Med. Times and Gaz.*)

"*Fractured Jaw; Profuse Hæmorrhage stopped by Digital Compression.*—W. C——, aged twenty-six, sustained a fracture of the lower jaw, opposite its left angle, by a blow with the fist. The accident happened on September 10th, and on the following morning the patient came to the hospital, bleeding freely from the mouth. The means employed by the house-surgeon were of little avail, and on Mr. Maunder's arrival, the bleeding continuing, the patient was sent to the operating theatre in case severe measures might be necessary to arrest the hæmorrhage. On examination the blood was seen to rush into the mouth through a fissure in the gum behind the last molar tooth, and the bleeding was at once controlled by compression of the left common carotid artery without discomfort to the patient. At one moment ligature of the carotid artery seemed inevitable; but compression being easily borne by the patient, some of the students responded to Mr. Maunder's call for aid (Messrs. Ceeley, Putsey, Barrett, Clouting, Ilott, and Vialls), and maintained compression for two hours and a half, with the effect of arresting the bleeding The patient was kept in his clothes in one position on a sofa for twenty hours, and then sent to his ward. He progressed perfectly satisfactorily, and was made an out-patient on September 27th."—(*Lancet.*)

"*Osteomalacia, especially of Old Age, and on the Presence of Lactic Acid in Osteomalacic Bones.* By Dr. O. Weber.—The essence of the puerperal form of osteomalacia, as also of the senile form, is, according to Weber, the resorption of the salts of lime, beginning in the walls of the Haversian canals and of the medullary spaces. He has also observed a distinct growth of the cartilage which remains after the resorption of the lime-salts, which growth takes place at the cost of the vanishing bone, so that the shape is preserved. This happens under inflammatory symptoms and rheumatic pains. The medulla was found often red, penetrated by small ecchymoses, the vessels of the Haversian canals more developed, and the growing cartilage-insulæ surrounded by blood-vessels. Osteomalacia must be regarded as a kind of ostitis."—(*Virchow's Arch.*, 1867, and *Brit. and For. Med.-Chir. Rev.*)

"*Preparation of Snails' Tongues.* By A. M. EDWARDS, New York — I present a plan devised many years ago, for such small forms as *Littorina* and the like, whose lingual ribbons are extremely tender, and difficult to see as well as handle. I use a rather strong solution of caustic potassa, the strength of which I cannot exactly specify, as it must vary with the species under manipulation, some having ribbons of such strength that they will bear the very strongest solution, while others will be injured by immersion in a comparatively weak liquid. Into this solution in a test tube or other convenient vessel, plunge the whole animal; in the case of the smaller creatures, shell and all. The specimen may be fresh, or preserved in alcohol, but on the former the potassa will act most vigorously. I have found that one good way is to let the animal stand in the shell until it dies and begins to decompose, when it can readily be removed, and falls in pieces. The lingual ribbon, as a general thing, is not easily decomposed. Now either set the potassa solution, with the animal in it, aside for some days, or boil it at once. You will then find that almost everything dissolves and becomes 'soap,' except the shell and operculum, a few shreds of muscular fibre, and the prized lingual ribbon. Frequent washing with fresh water now removes all the alkali, and leaves the teeth clean and in perfect order. It can then be mounted in any preservative fluid which is miscible with water, and is best removed to alcohol to be kept until it is mounted. To mount it, remove it from the spirit, and without drying plunge it in pure spirits of turpentine, in which it should be boiled for a short time to drive off some of the alcohol. It can now be mounted in Canada balsam, when it shows all its beauties in a remarkable manner, and, at the same time, shows its effects on polarized light. I would say, that the potassa cleans the shell and operculum beautifully."—(*Am. Naturalist.*)

"*Glycerin Solutions.*—For the benefit of those who prefer using glycerin rather than alcohol as a solvent for many agents, we append a few articles with their solubility in glycerin. Sulphur requires 2000 parts of glycerin; iodine, 100 parts; red iodide of mercury, 340 parts; corrosive sublimate, 14 parts; sulphate of quinia, 48 parts; tannin, 6 parts; muriate of morphia, 19 parts; tartar emetic, 30 parts; veratrine, 96 parts; atropia, 50 parts; iodide of sulphur, 60 parts; iodide of potassium, 3 parts; sulphuret of potassium, 10 parts. These solutions are called *glyceroles.*"—(*Jour. Appl. Chemistry.*)

"*Iodine Soluble in certain Organic Compounds.* HLASIWETZ.—Iodine dissolves to a considerable extent in aqueous solutions of resorein, orein, or phloroglucin, without imparting to them any color. These solutions may be boiled without iodine being volatilized; they have almost neutral reaction, and starch, or carbonic bisulphide does not indicate free iodine. A solution of the latter in alcohol or carbonic bisulphide is decolorized by adding one of the organic bodies mentioned, which may therefore be used in place of sulphurous acid in volumetric determinations by means of iodine. Other organic substances have been observed to behave in a similar, but less decided manner."—(*Akad. Wein.* and *Chem. News.*)

"*Liquid Soap.*—D. AUG. VOGEL, JR., recommends for this purpose Heeren's directions to saponify a mixture of 100 grammes glycerin and

32 grms. olein with 17 grms. concentrated potassa solution. To the soap, which is of the consistency of honey, add 3-5 grms. carbonate of potassa dissolved in a little water, allow to rest for some time, and decant. This soap may be mixed with, and serve as a vehicle for the external application of tannin, iodine, bromine, etc."—(*Buckner's Report and Journ. of Pharm.* and *Drug. Circ.*)

"*To Fix Pencil Writing.*—Pencil writing may be fixed almost indelibly as ink, by passing the moistened tongue over it. Even breathing slowly over the lines, after writing, renders them much less liable to erasure than when not subjected to that process. A trial of the experiment will readily satisfy any person of the utility of the idea."—(*Boston Journal of Chemistry.*)

"*New Galvanic Battery.*—We have had in use in our laboratory a most singular-looking piece of apparatus, devised by Moses G. Farmer, Esq., the well-known electrician of this city. It is a new form of instrument for converting heat into electricity, and most satisfactorily does it perform its work. All that is necessary to put it into active operation is to light a gas jet, and in a few moments the electrical impulses are manifested, and the battery is ready to be set to work. It deposits metals with great facility, and the development of the agent is constant and uniform so long as the heat is supplied. It resembles a 'fretted porcupine' as much as anything we can compare it with. The metals employed in its construction are antimony and copper. The strips or arms of copper protrude outward from the bars of antimony, so as to secure the cooling influence of an air current, while the gas is heating the other extremity. A portion of the heat of the flame is transformed over into electricity, thus showing the easy convertibility of one imponderable into another, and the correlation of the forces."—(*Boston Jour. of Chemistry.*)

Vitrifying Iron Surfaces.—"A new method of vitrifying the surface of iron has recently been introduced in Paris. Instead of covering the surface of the iron, according to the usual method, with a very fusible glass in powder, and then bringing the iron to a red heat, the materials of the glass are laid upon the iron, which is heated until perfect vitrification takes place. The consequence is that the iron becomes oxidized, and combining with the silicic acid, the iron and glass form one substance. The coating may be as thick as desired, but it is found in practice that a thick coat of glass soon breaks away, while a thin one lasts for a long time. The method is being applied or tried upon armor plates for ships."—(*Drug. Circ.*)

"*Preservation of Stone.*—This subject, which has attracted the attention of so many chemists, seems now to have been brought to a very successful point. We have received some specimens of chalk treated by a process discovered by Messrs. Dent and Brown, of the Chemical Department, Woolwich. Their process consists in the application of a solution of oxalate of alumina to the stone. The experiments date from December, 1865, and the results they have now obtained are most encouraging. The process is applicable to limestone, dolomite, and chalk, and may, we think, be made subservient to the preparation of lithographic stones.

Oxalate of alumina is readily soluble in water, and the solution, which is simply applied with a brush, is made of a strength varying with the porosity of the material to which it is to be applied. The specimens we have before us are left in the original condition at one end, and have been prepared with the solution at the other. The physical characteristics of chalk so treated are—lightness, the possession of a glazed surface approaching somewhat in appearance marble, and greatly increasing hardness; in this respect the stone is about equal to fluor spar, or 4 in Moh's scale. Furthermore, the lime being transformed into one of the most insoluble and unalterable of its compounds, and the alumina being precipitated, the pores are filled with a substance almost unacted upon by water or by the impurities present in the atmosphere of large cities."—(*Chemical News.*)

"*Chinese Cement.*—1. Take finest pale-orange shellac, broken small, one lb.; rectified alcohol, at ninety-five degrees, two lbs.; macerate together in a corked bottle until dissolved. It is very strong, almost odorless, and has the consistency of molasses. 2. This is prepared the same as above, but wood naphtha is used instead of alcohol, and is inferior to the following. 3. Take of borax two ounces; water one and a half pints; shellac six oz.; boil in a covered vessel until dissolved, and evaporate to a proper consistency. It is employed to mend glass, china, fancy work, jewelry, etc., for which purposes it is only inferior to Armenian cement."—(*Journal of Applied Chemistry.*)

"*To prevent Metals from Rusting.*—Dip the article into very dilute nitric acid, and afterward immerse it in linseed oil, allowing the superfluous portions to drain off. When the coating of oil is thoroughly dry, the article will be ready for use, and thus protected will remain bright for years."—(*Ibid.*)

"*To remove Rust Stains.*—Stains of iron rust may be removed from linen or cotton thus: Wash the cloth through one suds, and rinse. When wet, rub ripe tomato juice on the spots. Expose it in the sunshine until nearly dry, and wash in another suds."—(*Ibid.*)

"*Mastic Cements.*—Böttger has recently published some account of these cements, and states that they are mixtures of one hundred parts of sand, limestone, and litharge, with seven parts of linseed oil. These ingredients carefully mixed and well worked together will have the consistency of moist sand, and at first but little coherence. When pressed, however, the mixture gradually acquires the hardness of ordinary sandstone, and in six months' time will emit sparks when struck with steel, The binding agents in such cements are the litharge and oil, the sand giving the body, and limestone or chalk filling up the interstices."—(*Sci. Amer.*)

"*Cement for Iron and other Substances.*—A correspondent asks, 'What is the best known substance for sticking sheepskin to iron?' We reply, that any fibrous material can be 'stuck' to metal, whether iron or other metal, by an amalgam composed of glue dissolved in vinegar, hot, with one-third of its volume of white pitch-pine, also hot. The composition will give a sure and certain return."—(*Ibid.*)